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# The Interregional Trade of Services and the Effects of Social and Business Networks: With application to Accommodation, Restaurants and Travel Agencies flows in Spain.

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Todas las cosas están relacionadas entre sí, pero las cosas más próximas en el espacio tienen una relación mayor que las distantes.

Tobler, W. R (1970)

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# Resumen

A pesar de que los servicios representan casi tres cuartas partes de la economía de la mayor parte de los países, esta magnitud se reduce cuando nos fijamos en el porcentaje que representan sobre el comercio mundial. Este hecho está relacionado con las características de los servicios y sus diferencias respecto de los bienes. En particular, el hecho de que los servicios no son almacenables hace que, su producción y venta van, en muchos casos, intrínsecamente unidas, y es necesario que para que tenga lugar el intercambio, el productor y el consumidor se encuentren en el mismo espacio al mismo tiempo (*proximity burden*).

Así, la mayor parte de la producción de servicios se considera que es consumida y vendida dentro de las fronteras del mismo país (ya que no se exporta internacionalmente). Pero, ¿implica esto que son bienes no comercializables?

Podemos esperar que los flujos interregionales de servicios sean mayores, dada la mayor movilidad interna de personas, bienes, servicios y capital dentro de las fronteras nacionales, así como el mayor nivel de integración dentro de los mercados nacionales.

Sin embargo, la falta de estadísticas sobre las interacciones que se dan entre los agentes dentro del mismo país ha impedido la elaboración de bases de datos con un detalle suficiente sobre los intercambios comerciales dentro de las fronteras del país. Estas limitaciones estadísticas han limitado el análisis de los flujos interregionales de servicios en la mayor parte de países del mundo. De hecho, cuando se han intentado medir los flujos interregionales de servicios, se encuentran mayores restricciones que para el comercio internacional (UN, 2011). Como consecuencia de todo lo anterior y dentro del contexto del creciente interés por el comercio internacional de servicios, hay un cierto abandono relativo del comercio interregional. El principal objetivo de esta tesis doctoral se centra en la estimación, modelización y análisis del comercio de servicios principalmente dentro de las fronteras de un país.

Más específicamente, aunque las contribuciones incluidas en este trabajo se han desarrollo con la idea de responder a cuestiones generales que todavía están pendientes en el campo de la teoría y las aplicaciones empíricas sobre la modelización de las interacciones sociales y económicas que tienen en cuenta el ámbito y la agregación geográfica en la que tienen

lugar, la mayor parte de los esfuerzos y tiempo se han dedicado al análisis de tres sectores de servicios en España: Hostelería, Restauración y Agencias de Viaje.

¿Por qué España y por qué estos sectores?

España es uno de los países más turísticos en el mundo. Este liderazgo ha promovido la investigación en casi todos los aspectos de esta compleja actividad, que incluye una gran variedad de sectores. Aunque el número de estudios centrado en el ámbito interregional con un enfoque de tipo bilateral es mucho más limitado. Además, consideramos que los resultados obtenidos para un país como España, puede servir como referencia para otros países y sectores.

Aunque el objetivo principal es extender en el futuro este análisis a otros sectores, se puede considerar que como punto de arranque es bastante razonable centrarse en aquellos sectores que están directamente ligados con los movimientos de personas y que quedan recogidos en las estadísticas sobre sus viajes y pernoctaciones. Además, y tal como se explicará en el primer capítulo de este trabajo, analizar los flujos comerciales de ciertos servicios, ayudan a entender mejor el comportamiento de los de bienes, así como de otros servicios.

En el presente trabajo nos preguntamos cómo esto cambia cuando centramos el análisis en las interacciones económicas que tienen lugar dentro del mismo país, más que entre países. A este respecto, la literatura del efecto frontera encuentra que cerca del 80% de la producción se consume dentro de cada país, más que internacionalmente, porcentaje que se espera mayor para los servicios. Pero, ¿cómo de comercializables son los servicios dentro del marco doméstico?

***Análisis previos sobre el comercio interregional de servicios en España.***

Al contrario que para el caso de los flujos interregionales de bienes (McCallum, 1995; Combes et al, 2005; Llano et al, 2010), hay muy pocos estudios que cuantifiquen, modelicen y analicen los flujos bilaterales de servicios dentro de un país. El principal intento se ha desarrollado en el contexto de grandes modelos input-output y de modelos de equilibrio general computable (Isard, 1951, 1953; Polenske 1980; Hewings and Hulu, 1993; Benvenuti et al.,1995).

Para el caso de España, ha habido algunos intentos esporádicos de estimación de los flujos de servicios para algunas regiones específicas como Cataluña (Parellada et al., 1997) o Madrid (Mella and Sanz, 2001, 2003), dentro del contexto de las Balanzas de Pagos regionales. Estos estudios han sido capaces de ofrecer cierta desagregación respecto a la estructura de los flujos de origen y destino. Además, a nivel regional, pero sin información

de origen-destino de los flujos, se puede contar con cierta información en las tablas input-output regionales (TIOR) publicadas por los institutos de estadística regionales. Además, en el contexto de un primer modelo input-output para la economía española, Llano (2004) estimó por primera vez un conjunto completo de matrices origen-destino de bienes y servicios. Aunque este trabajo se centró en el año 1995, y se optó por estimar los flujos de servicios a través de un modelo gravitatorio. Finalmente, Alcaide y Alcaide (2005) estimaron, usando procedimientos abajo-arriba, los flujos interregionales de servicios (sin desagregación por origen y destino) para cada región (Nuts 2) y provincia (Nuts 3) españolas.

En este contexto de estudios para el caso español, hay 3 artículos directamente relacionados con la presente tesis doctoral. Estos artículos han sido publicados en revistas académicas del campo de la economía regional. Todos se basan en una primera versión simplificada de la base de datos que se presenta en el capítulo 2 de esta tesis. Esta es la primera base de datos, que incluye Hostelería, Restauración y Agencias de Viaje en España únicamente elaborada para los años 2001 y 2007, en lugar del período completo 2000-2009 que se consigue con la metodología presentada en el capítulo 2 y analizada a lo largo de esta tesis doctoral.

En un primer artículo, Llano y De la Mata (2009) estimaron los flujos monetarios de Hostelería, Restauración y Agencias de Viaje en España adoptando un enfoque multiregional y desde una perspectiva bilateral para el 2001 basándose en 3 matrices de pernoctaciones alternativas.

En un trabajo posterior (Llano y De la Mata, 2010), un primer análisis de esta base de datos se ha desarrollado empleando el modelo gravitatorio para identificar los principales factores explicativos del volumen total de flujos bilaterales. Finalmente, en De la Mata and Llano (2012) diferentes especificaciones de la ecuación gravitatoria se aplican a las anteriores bases de datos provisionales. En este último artículo, empezando con un modelo gravitatorio básico, se describen dos modelos aumentados, cada uno de ellos con variables alternativas en relación con la actividad turística en cada región. Los modelos gravitatorios utilizados se basaron en especificaciones utilizadas en el campo de la economía regional y la economía del turismo, más que en las teorías del comercio, puesto que omiten factores como los términos de resistencia multilateral (Anderson and van Wincoop, 2003). A este respecto es importante decir que el objetivo de aquellas primeras investigaciones era la exploración del impacto de las diferencias idiosincráticas de las regiones en términos geográficos y de infraestructuras turísticas (número de hoteles, longitud de las costas, temperaturas relativas, etc.) como factores de los flujos

interregionales de los sectores ligados al turismo en España. Además, este último trabajo, trataba de evaluar brevemente los diferentes resultados en cada tipo de flujo, diferenciando entre aquellos derivados de pernoctaciones en establecimientos turísticos y en segundas residencias, dada la naturaleza diferente de ambas categorías de viajes.

Además, en el contexto del proyecto c-intereg (www.c-intereg.es) una metodología similar a aquella descrita en Llano y De la Mata (2009) para la agrupación de Hostelería, Restauración y Agencias de Viaje, se ha desarrollado para la elaboración de una base de datos de flujos interregionales de transporte, diferenciando entre transporte de viajeros y de mercancías, en 4 modos diferentes de transporte: carretera, ferrocarril, barco y avión (http://www.c-intereg.es/servicios/Informe_c_intereg_servicios_transporte.pdf). Aunque este tesis doctoral se central en el análisis de los sectores de Hostelería, Restauración y Agencias de Viajes, será interesante analizar las interacciones entre estos sectores y los del transporte.

***Estructura de la tesis y principales contribuciones***

Esta tesis doctoral contiene 4 capítulos que están basados en artículos y documentos de trabajo publicados, además de un capítulo introductorio que explica de manera más detallada la motivación, objetivos y marco en el que se desarrolla la presente tesis doctoral. Por último, se incluye un capítulo con las principales conclusiones de cada capítulo, algunas de las consecuencias de política económica que se pueden extraer de estos análisis así como una agenda de futuras investigaciones que confirma que esta es una línea de investigación novedosa y prometedora.

Este trabajo de investigación pretende contribuir al entendimiento de los patrones de comercio interregional de algunos servicios centrándose principalmente en el papel de las redes sociales y empresariales y las interacciones entre regiones como factores potenciales que afectan al comercio interregional.

Las contribuciones de esta tesis doctoral se agrupan en 3 campos principalmente:

i. Propone una metodología para superar el problema de la falta de información estadística respecto a los flujos domésticos de servicios que no permite el análisis empírico de las relaciones comerciales y la integración económica dentro de las fronteras de un país.
ii. Se han llevado a cabo varias aplicaciones empíricas que consideran la heterogeneidad en los flujos de unos sectores y otros, la creación de comercio de las redes sociales y empresariales y la interacción entre las regiones españolas.

iii. Por último, se ha puesto en evidencia la necesidad del desarrollo de un modelo teórico, dentro del marco estándar de los modelos de comercio intraindustrial de las nuevas teorías de comercio, basados en las economías de escala y la competencia monopolística, que tenga en cuenta la heterogeneidad en los consumidores, como marco general para el análisis del efecto de las redes sociales en los flujos comerciales a través de sus preferencias.

***Principales resultados***

Se ha descrito una metodología para la estimación de los flujos interregionales de los sectores de Hostelería, Restauración y Agencias de Viaje, para el caso de las regiones españolas en el período 2000-2009. Esta metodología se ha propuesto teniendo en cuenta el origen y destino de los viajes de los residentes españoles obteniendo unos resultados compatibles con las principales cifras de producción nacional, regionales y exportaciones internacionales.

Se ha realizado un primer análisis descriptivo de los patrones geográficos de los principales flujos interregionales, se ha encontrado un comportamiento heterogéneo en función del sector. Para algunos sectores como la Restauración, los flujos intrarregionales, así como los flujos en las distancias cortas son muy importantes debido al consumo en las regiones de residencia, y por los viajes cortos a las regiones cercanas durante los fines de semana (a veces, excursiones), en general con el objetivo de visitar a sus familiares o amigos en las regiones contiguas. Sin embargo, para el sector del alojamiento-hostelería se verifica una situación diferente debido a que la gente busca lugares más diferentes para viajes más largos, y por la la imposibilidad de visitar lugares distantes sin pasar la noche en algún establecimiento. A veces, los mayores flujos se encuentran entre las regiones que están estrechamente vinculados a través de los stocks de inmigrantes.

Aunque el efecto de las redes sociales y empresariales, se espera que sean más relevantes para el comercio internacional que para el interregional en el caso del comercio de mercancías, teniendo en cuenta que las diferencias entre las instituciones de distintos países son mayores que para las instituciones de distintas regiones dentro del mismo país. Para el caso de los servicios, se puede esperar una situación diferente. Para algunos sectores, los lazos sociales y familiares, explican en mayor medida el viaje a una región determinada, que las ganancias potenciales en términos de comercio doméstico debido a la reducción de los costos de información.

El capítulo 3 muestra un efecto heterogéneo de las redes sociales y de negocios analizando por separados los sectores de Hostelería, Restauración y comparando los resultados con

un análisis similar para las mercancías. En este capítulo, se confirma una situación en la que la red social actúa como un sustituto de las empresas para la Hostelería, mientras que los flujos comerciales del sector de la Restauración se ve reforzada por el incremento de los viajes promovido por la existencia de ciertos lazos personales y familiares. Cuando los resultados de los servicios se comparan con los obtenidos para las mercancías, el diferente comportamiento de los bienes y servicios se confirma. Entonces, para los flujos comerciales interregionales de mercancías se confirma un mayor efecto de las redes empresariales.

Centrándonos en el efecto promedio y con un interés especial en la forma en que los flujos entre regiones cercanas se comportan, en el capítulo 4 se confirma la autocorrelación a través de los flujos tanto hacia / desde regiones contiguas y desde / hacia regiones con fuertes vínculos demográficos. Los resultados obtenidos en el último capítulo empírico (capítulo 4) sugieren la necesidad de considerar la influencia de los vecinos cuando se intentan explicar los flujos comerciales con una desagregación origen-destino. Sin embargo, los coeficientes obtenidos en el capítulo 4 no cambian drásticamente respecto a los obtenidos en los capítulos anteriores, cuando se incluían efectos fijos para las regiones de origen y destino, que en parte capturan las relaciones de interacción regional entre las regiones de cada par ij. De todas formas, en línea con algunos artículos recientes (Behrens et al, 2012), parece conveniente proceder con algún tipo de tratamiento para la posible autocorrelación espacial que puede afectar a nuestras estimaciones..

Las conclusiones finales se derivan del modelo teórico, que desarrolla un modelo analítico que relaciona las poblaciones migratorias, las diferencias en la disposición a pagar por los productos locales, frente a los del país de origen o los importados, y la posibilidad de diferenciación de precios por las empresas de un país entre diferentes mercados determinados geográficamente, de acuerdo con la estructura demográfica de las poblaciones. Aunque se podría aplicar al caso particular de los servicios, este artículo sigue un enfoque más general que hace que sea también adecuado para el caso de las mercancías. Los resultados del modelo establecen que si existe una preferencia por los productos del lugar de origen, la existencia de los flujos migratorios cruzadas aumenta los flujos de comercio bilaterales (las cantidades producidas para el mercado exterior: las exportaciones / importaciones, es decir, se confirma el efecto pro-comercio de la migración) a expensas de la producción destinada al nacional. En consecuencia, el precio es menor cuanto mayor sea la participación de los inmigrantes en el territorio en el que opera la empresa, pero mayor en los mercados extranjeros si el stock de inmigrantes del

país donde se produce la mercancía aumenta. Este resultado se mantiene independientemente de que las empresas discriminen precio o no.

Dentro del capítulo teórico, el análisis del bienestar basada en el excedente del consumidor resume los efectos globales en el número de empresas, las cantidades y los precios. Un resultado relevante es que, contrariamente a los resultados comunes dentro de un modelo de comercio intra-industrial con consumidores homogéneos donde los flujos migratorios es irrelevante, ya que no cambian el consumidor representativo, y en que al abrirse los países al comercio aumenta el bienestar social, en el caso en que los individuos presenten unas disposiciones a pagar distintas para los productos de su país de origen y de residencia, la apertura de los países al comercio es perjudicial en términos de bienestar si las poblaciones de inmigrantes y emigrantes son pequeñas. Este resultado responde al hecho de que, puesto que hay un efecto de las preferencias por los productos de su lugar de origen frente a los productos importados, la apertura de los países al comercio aumenta la competencia entre las empresas en un grado mayor que el efecto del incremento de la demanda provocada por el incremento de la demanda interna en una magnitud equivalente a la demanda exterior, terminando con una reducción en el bienestar social al desviarse parte de la cantidad producida hacia poblaciones que presentan una menor preferencia por esos mismos productos, que no es suficiente para compensar la ganancia en bienestar por el consumo de una mayor cantidad de variedades o por un menor precio. Por el contrario, cuando los flujos migratorios aumentan, el bienestar social en la economía global abierta, aumenta, mientras que se reduce en el caso de las economías cerradas — considerados también de manera agregada—. Llegado un momento en el que los stocks de migración son suficientes, el bienestar social en el caso de las economías abiertas supera al de las economías cerradas.

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# 1. A brief review on international and interregional trade of services.

## 1.1. Introduction

The aim of this chapter is to describe the motivation, objective and structure of this Doctoral Thesis. The point of departure is a brief review of the literature on trade of services, highlighting the difference between the trade of goods and services, both, within an international and interregional framework. Then, we describe some previous attempts of analyzing interregional trade flows in Spain, which will serve as a natural context for describing the main contents of the subsequent chapters.

## 1.2. Trade of Services: concepts, definitions and specificities

Services currently represent more than two thirds of world's GDP. This share rises significantly for the group of high income countries, where it accounts for around a 73%. By contrast, world exports of services amounted to US$ 3,67 trillion in 2010, suggesting that the share of services in world trade is still around 20%; a modest figure, which surprisingly has recently been labeled by the WTO as a milestone in global integration. How can it be possible?

Usually, this lower share of international trade of services with regard to aggregate output is explained by the intangible nature of services as well as the non-tradable characteristics of some of them. For example, it is argued that the intangible nature of services, imposes additional constrains when trading: while a good is produced, stored, moved and consumed at different places and times, the delivery of a service is seldom dissociated from its production and its consumption, requiring the proximity of the supplier and the customer. This feature is what Christen and Francois (2009) labeled *"the proximity burden"*.

In addition, although services have been traditionally considered as non-tradable (Baumol, 1967; Fuchs, 1968; and Hill, 1977, are exceptions) according to the WTO worldwide international exports have tripled between 1990 and 2005. In particular, with the breaking up of the production chain and the increasingly importance of trade in tasks, instead of trade in products, the production process is located in farther away places and, as a result, the international trade of producer services has grown considerably in the recent years. In fact, despite the trend to liberalize international trade of goods, the growth of trade in services is almost equal to that experienced by trade in goods.

However, and despite the increasing importance of services, more in developed countries, we can fairly say that their importance is reflected neither in theoretical models nor in the quality of statistics.

Trade theorists have taken as granted that the models for goods, can be straightforward extended to services, without taking into consideration the special characteristics of services. For example, due to the fact that, in the majority of the cases, trade of services does not imply a cross-border movement susceptible to be reported in customs, services have been deemed as 'non-tradable goods'. Because of these circumstances, the available information in production and trade in services has been and remains very scarce. Until recently, all the information about international trade in services was the aggregate information contained in the balance of payments.

Despite this situation, it is worth mentioning that some efforts are being done, both from the economic theory and from the competent institutions responsible for data collection, so as to make possible that services receive the attention that they deserve given their economic importance; at least, domestically. However, although the globalization process and the recent boom of international trade of some services and FDI has promoted the development of theoretical frameworks (Helpman, 1984a, b; Markusen, 2002; Markusen and Venables, 2002; Christen and Francois, 2009) and statistics (UN, 2011) for modeling international trade of services, the effort made by national and international organizations on promoting the same attempt at the interregional sphere is clearly more limited. This fact is in contrast with the recent development of the literature on border effect (McCallum, 1995; Combes et al, 2005) or the New Economic Geography (NEG), where the international trade flows of goods between countries is analyzed in parallel with the interregional economic relations taking place within each one of them, and pondering the endogenous relation of trade with the internal geography of the exporting country and the internal location (agglomeration) of firms and labor force in each country (Brulhart, 2011). Again, while this literature is mixing the internal and external side of the good's trading activity, the development of similar theoretical and empirical models in the context of services seems to have received less attention.

In the next section we try to give some intuitions about the reasons of this relative elusion and lack of interest on the interregional trade of services, which in fact account for the largest share of economic activity in most part of the developed countries, and are routinely considered as domestic demand within the (aggregate) geographical scope of national statistics. Then, based on these reflections, we will be able to build up the main motivation for the rest of the chapters included in this dissertation.

### 1.2.1. Trade of services: reflections about the nature and modes of delivery.

First of all, it is convenient to start with a canonical definition of "services", which in this case is borrowed from the main international body responsible of setting the conceptual standards for elaborating National Accounts. Thus, according to the United Nations:

'*Services are the result of a production activity that changes the conditions of the consuming units, or facilitates the exchange of products or financial assets*. These types of service may be described as '*change-effecting services*' and '*margin services*' respectively. '*Change-effecting services*' are outputs produced to order and typically consist of changes in the

conditions of the consuming units realized by the activities of producers at the demand of the consumers. Change-effecting services are not separate entities over which ownership rights can be established. They cannot be traded separately from their production. By the time their production is completed, they must have been provided to the consumers.' And 'Margin services result when one institutional unit facilitates the change of ownership of goods, knowledge-capturing products, some services or financial assets between two other institutional units. Margin services are provided by wholesalers and retailers and by many types of financial institutions. Margin services resemble change effecting services in that they are not separate entities over which ownership rights can be established. They cannot be traded separately from their production. By the time their production is completed they must have been provided to the consumers.' (United Nations, 2009: *System of National Accounts, 2008,* p. 96, par. 6.17, and p.97, par. 6.21).

Departing from this definition, different authors have singled out some specific characteristics that differentiate goods and merchandises from services (Wolak et al., 1998):

1) Intangibility

Intangibility has been recognized as one of the main characteristics of services that differentiates them from merchandises (Bebko, 2000), and it is common to all services, although with differences in the degree of intangibility. Consequently, this characteristic and its effects on consumers and suppliers have been broadly studied in other areas of research as marketing. The intangibility in services may be related with a greater importance of trust between the consumer and the provider. Then, trade in services should be enhanced by all the factors and channels that increase trust and information between the agents that takes part in the exchange.

2) Inseparability

Inseparability refers to the fact that the consumption and provision of the service take place instantaneously (Onkvisit and Shaw, 1991). This is linked with the 'proximity burden' described in Francois and Hoekman (2010).

3) Heterogeneity

Heterogeneity reflects the potential for high variability in service delivery (Zeithaml *et al.,* 1985). Wyckham *et al.,* (1975) suggest that heterogeneity can be a benefit for firms as base

for differentiation. This characteristic may be linked with a higher elasticity of the demand for some services; e.g., a service as the one provided by Restaurants is very heterogeneous, thereby being profitable for the firm because competition reduces as far as the 'product' is somehow different to any other service provided by any other firm, and market power arises. Then, if one individual has a special preference for the 'product' of one firm it will be more difficult to substitute it and her willingness to pay will be higher.

4) Perishability

In general, services cannot be stored and carried forward to a future time period (Rathmell, 1966; Donnelly, 1976; and Zeithaml *et al.,* 1985). Onkvisit and Shaw (1991) suggest that services are "time dependent" and "time important" which make them very perishable. Due to the impossibility of storing services, because usually they are not materialized in an object, it is needed that the relationship between producer and consumer to be relatively close and immediate. In this sense, the recent development of information technology has made possible a faster and cheaper communication, favored with the increase in services trade (Cuadrado et al., 1989).

According to these characteristics, there are some services that are not transportable, and it is the consumers or the producers who should move to make exchanges possible, that is why it has been needed to adopt a broader definition of '*trade in services*' than for '*trade in goods*'. In this way, GATS identify as trade in services both, the transactions between residents and non residents in an economy, as well as the movements between producers and consumers' countries and vice versa.

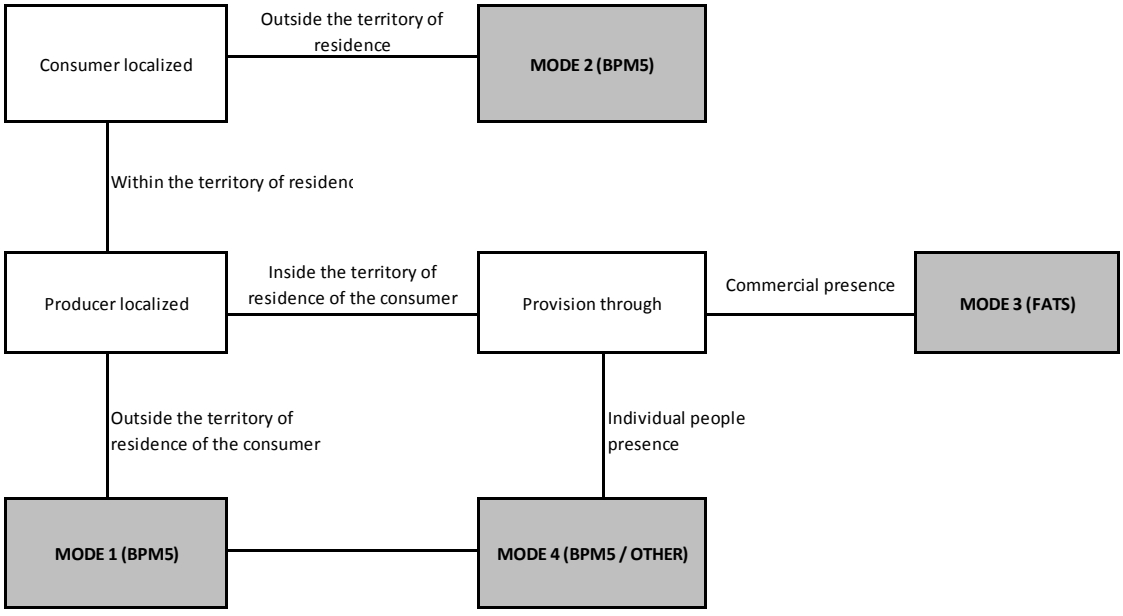
In the GATS, trade in services are defined based on the location of the supplier and the consumer, taking into account their nationality or residence. Currently, GATS identifies four ways to trade services.-Each of them considers alternative channels for the interaction between residents and non-residents in an economy:

- **Mode 1** (Cross-border provision): both the consumer and the supplier are in their respective territories, being the service what crosses the boundary. This is the traditional notion of trade. They are, for example, services supplied by internet or telephone.
- **Mode 2** (Consumption abroad): the consumer travels to a foreign country where the producer is located in order to consume the service. This is the case of some services related with tourism.

- **Mode 3** (Commercial presence): the supplier of a service establishes a branch in another territory in order to secure contact with the consumers in their home country, and provides the service in the territory of the consumer. Production process, distribution, commercialization, sell and delivery of the service are considered as part of the service itself. This is related with a part of the FDI process.
- **Mode 4** (Producer presence): the person who provides the service moves to the country where the consumer lives. This is the case of an independent architect travelling abroad to oversee a construction in another country.

In **Figure 1.1** it is shown a classification method proposed in the Statistical Manual of Trade in Services of United Nations (United Nations, 2011), with the aim to facilitate the statistical classification of the different modes of trade in services. This classification uses the location of producers and consumers when the transaction is done, as the way it is done.

**Figure 1.1. Scheme of the different modes of trade services.**




Source: United Nations (2011). Manual on Statistics of International Trade in Services 2010. Pg. 121.

Due to the intangible nature of services, as well as the multi-secular strong restrictions to factor movements among countries, international trade of services has been largely concentrated in those modes that do not imply permanent migration or capital movements (mode 1 and 2), but instead take the form of short term displacements of goods (transport) and consumers (travel). These two modes of supplying services are the ones that traditionally have accounted for the largest share of interactions, at least when one focus on international trade. However, as the WTO and several authors have pointed out, the structure of international trade in services has shown significant changes in recent years, mainly due to a sharp increase in the levels of migration, FDI flows and financial integration fuelled by globalization and the communication revolution (Francois and Reinert, 1997, Schettkat and Yocarini, 2006, Francois and Woerz, 2008, Francois and Hoekman, 2010).

In spite of these recent trends, services have traditionally been considered as non-tradable goods by trade theorist. Thus, during decades, the economic activity produced by the services sectors has been largely considered as 'intra-national'. This is linked with the predominance of merchandise exports over commercial services. This prevalence is very stable over time as can be seen in **Figure 1.2**. Then, if the interregional or domestic trade is very important for merchandise, it is even larger for services that, in fact, accounts for the largest share of the gross domestic product in all the developed countries.

**Figure 1.2. Preponderance of merchandise trade over trade in commercial services.**


Source: World Trade Organization.

### 1.2.2. Interregional trade of services.

Then, it is interesting to wonder how this picture changes when the analysis zooms into the economic interactions taking place within a country, rather than between countries.

Focusing on international trade flows of services, the largest part of trade is considered as 'intra-national', then should we consider that the 'inter-regional' trade flows within that country are null, and therefore, the economic activity of services has to be considered also as 'intra-regional'? Unfortunately, the answer to this question is not straightforward. We want now to comment at least the following two reasons:

On the one hand, if the recent increase in the share of international trade of services is explained by the flows of transport and tourism, as well as a rise in the liberalization of migration and FDI flows between countries, one may expect that interregional trade of services within a country should be enormous, taking into account the unrestricted movement of people, goods, services and capital within national borders, as well as the major level of integration taking place within domestic markets. To this regard, the literature on *border effect*, which has focused mainly on the share of interregional versus international trade of goods, has shown higher levels of economic integration within countries than between them (McCallum, 1995; Wolf, 2000; Anderson and van Wincoop, 2003).

On the other hand, in contrast to this idea, due to data restrictions, the empirical evidence on these expected strong interregional flows of services is very weak. The lack of statistics on the internal economic interactions has impeded the measurement of interregional trade flows of services in most countries in the world (if not in all!). In fact, when statisticians have tried to replicate the "national standards" for measuring international trade flows of services at the regional level (UN, 2011), they found that even larger restrictions arise. To this regard, in our view at least 4 causes are behind this fact:

1) National borders constitute important points for collecting information on international deliveries of services linked to 'travel' and 'transportation' (i.e., linked to mode 1 and 2, involving some kind of cross-border actions). Conversely, internal borders within countries are usually more vaporous (if non-existent), and therefore cannot serve as collectors of the same type of data.

2) Traditionally, another source for estimating the international trade flows of services have relied on the national balance of payments; and these, on the presence of exchange control systems at the national level, which offer the right information on currencies and capital flows between countries. Obviously, control systems do not hold for interregional transactions within countries;

3) In addition, all the international organizations with competence in trade of services have emphasized the need for measuring the value of services delivered to markets through foreign affiliates (usually connected with modes 3 and 4). This figure is not captured by the balance of payments, and instead it should be captured by Foreign Affiliate Trade Surveys (FATS). Again, when considering the interregional trade of services, one realizes that, for the domestic market, many firms are "multi-regional" and have affiliates in different regions within the same country (almost behaving as *"multi-nationals"* with regards to mode 3). Therefore, national statistical systems are not able to offer the required information on this colossal source of trade of services within a country;

4) Finally, international trade of services usually focuses on commercial services, neglecting the ones delivered by the public sector, since they are usually offered to nationals (or aliens with residence). However, when the analysis focuses on the interregional trade of services, for example, it can really become an issue to quantify how much of the public health services delivered in a region has been consumed by nationals living (and paying taxes) in another.

### 1.2.3. Previous literature on the analysis of interregional trade of services in Spain.

Contrary to the case of interregional flows of goods (McCallum, 1995; Combes et al, 2005; Llano et al, 2010), there are very few studies that have quantified, modeled and analyzed the bilateral trade flows of services within a country. To the best of my knowledge, the main attempts have been developed in the context of large interregional input-output models and computable general equilibrium models (Isard, 1951, 1953; Polenske 1980; Hewings and Hulu, 1993; Benvenuti et al.,1995).

For the Spanish case, there has been some sporadic attempts to estimate the interregional trade of services for some specific regions such as Catalonia (Parellada et al., 1997) or Madrid (Mella and Sanz, 2001, 2003), within the context of the Regional Balance of

Payments. These studies have been able to offer certain breakdown regarding the origin-destination structure of the flows. Also at the regional level, but without information on the origin-destination dimension of the flows, we may count on the information contained in the Regional Input-Output Tables (TIOR) published by the regional statistical institutes in the country. Then, in the context of a first interregional input-output model for the Spanish economy, Llano (2004) estimated for the first time a complete set of origin-destination trade matrices for goods and services. However, this work focused on a single year (1995), and due to data scarcity, opted for estimating the interregional flows of the "service sectors" by means of a constrained gravity model. Additionally, Alcaide and Alcaide (2005) estimated, using top-down procedures, the aggregate inter-regional trade in services (without the origin-destination breakdown) for each Spanish region (Nuts 2) and province (Nuts 3).

In this context of studies for the Spanish case, there are three recent articles that are indeed directly related with this Doctoral Thesis. These papers have been already published in academic journals specialised in regional economics. All of them were based in a first simplified version of the dataset that is presented in the next chapter. The first dataset considered just the interregional trade flows of Accommodation, Restaurants and Travel Agencies in Spain in 2001 and 2007, instead of the whole period 2000-2009 obtained with the methodology presented in chapter 2, and that is analyzed in this Doctoral Thesis.

The first paper, by Llano and De la Mata (2009) estimated the interregional monetary flows of Accommodation, Restaurants and Travel-Agency sectors in Spain adopting a multiregional and bilateral perspective for 2001.

In a subsequent work (Llano and De la Mata, 2010), an initial analysis of this database was carried out employing the gravity model to identify the main explanatory factors for the volume of total bilateral flows. Finally, in De la Mata and Llano, (2012) different specifications of the gravity equation are applied to the previous provisional database for the interregional trade of Accommodation, Restaurants, and Travel agencies in Spain, always under a cross-section perspective. In that paper, starting out with a basic gravity equation, two augmented models were described, each one considering alternative variables related to the touristic activity in each region. The gravity models used there were based on the specifications adopted in the field of regional studies and tourism economics, rather than in international trade, since they omit some fundamental aspects such as the introduction of the multilateral resistance term. With this regard, the emphasis

was on exploring the impact of different idiosyncratic features of the regions in terms of geography and touristic infrastructures (number of hotels, coast length, relative temperature, etc.) as potential drivers of the interregional trade flows of tourism within Spain. This paper briefly evaluated to what extent the results vary depending on the type of flow, marking the difference between just two types of trips, namely, overnight stays in touristic establishments and in second homes. Through all these specifications, we were able to test the different elasticity of each kind of flow, in terms of the distance and pull-and-push factors driven by the gravity equation. Finally, in that paper we tackled the spatial autocorrelation in the residuals, finding heterogeneous results for each type of flow.

In addition, in the context of the c-intereg project (www.c-intereg.es) a similar methodology than the one described in Llano and De la Mata (2009) for Accommodation, Restaurants and Travel Agencies, has been developed in order to obtain a database for the interregional trade flows of Transportation, differentiating between transportation of people and goods, by 4 transport modes: road, railway, boat and plane (http://www.c-intereg.es/servicios/Informe_c_intereg_servicios_transporte.pdf). Although this Doctoral Thesis focuses on the analysis of the trade flows of Accommodation, Restaurants and Travel Agencies, in future works the interaction between both sectors will be analyzed.

## 1.3. The objectives of this Doctoral Thesis

Within this context of increasing interest on international trade of services, but relative abandonment of their interregional counterparts taking place within each country, **the main objective** of this Doctoral Thesis focuses on the estimation, modeling and analysis of interregional trade flows of goods and services (mainly) within a country.

More specifically, although the contributions included in this volume have been developed with the aim of answering general questions that are still open in the field of trade theory and empirical modeling of economic and social interactions at a spatial or geographical level, my efforts have concentrated in analyzing the bilateral trade flows of three main service sectors in Spain, namely, the Accommodation, Restaurants and Travel Agencies.

Why Spain? Why these three service sectors?

Spain is one of the most touristic countries in the World. This leadership has promoted research in almost every aspects of this complex activity, which involves the interaction of

several sectors. However, the number of studies focused in the domestic trade with a specific consideration of bilateral monetary flows is limited. Therefore, we considered that the results obtained in a middle-size, and truly open (single market) country with regards to these three service sectors, would serve as a useful reference for other countries and sectors with a lower level of international openness.

Regarding the sectoral focus, although the aim is to extend this analysis to other service sectors in the future, we think that a good starting point is considering service sectors that are directly connected to interregional cross-border movement of people, such as those linked to the domestic trips and overnight stays.

With regard to this specific focus of this Doctoral Thesis, it is helpful to consider what has been said by others regarding the convenience of analysing service sectors separately, sector by sector:

> *'Sector-focused studies reveal that it makes little sense to speak of "the service sector." Different services play diverse roles in the economy, will have distinct market structures, and differ in terms of the relative importance of the alternative channels through which markets can be contested by foreign firms. An implication for economy-wide modeling and analysis of policy reform is that these idiosyncrasies must be taken into account. Along these lines, more research is needed on interactions between different modes through which firms in a given industry can supply foreign markets, as this will determine in practice which policies are a binding barrier to trade and which may be redundant. More generally, such knowledge is needed to identify the appropriate sequencing and design of liberalization – including complementary regulation'.*
>
> Francois and Hoekman, 2010

Departing from this statement, it seems convenient to analyse each sector individually, and consider their specific characteristics. Moreover, in line with Deardoff (2001), by analysing the flows of these three service sectors, we will be able to better understand the flows of goods, as well as the flows of other services in the future.

> *'Many services play a critical facilitating role in the international trade of products other than themselves, including both goods and other services. This is most obviously true of transportation services, which are necessary for all international trade in goods. But it is*

*also true, perhaps to a lesser extent, of other services such as finance, insurance, and communication, as well as some professional services that are often needed in order to complete the international exchange of goods. And this is equally if not more true of international exchange of services themselves. Tourism, for example, depends critically on international provision of passenger transportation'.* Deardoff, 2001.

## 1.4. The structure of this Doctoral Thesis

This dissertation contains **four essays** that are based on published papers and working papers. This research work tries to shed some light on the patterns of interregional trade on some services with a special focus on the effect of social and business networks among regions as potential factors driving trade, and considering the interactions between regions. This dissertation makes several contributions in different lines: first, it proposes a methodology in order to overcome the problem of the lack of statistical information on interregional trade of services. Second, several empirical applications are undertaken considering the heterogeneity of the flows, the trade creation effect of networks and the spatial interaction of the flows between neighboring regions. Finally, the need of a theoretical extension of the standard intraindustry trade models based on scale economies and monopolistic competition, taking into account the heterogeneity of consumers, is suggested as the proper framework to analyze to what extent the existence of strong social networks between regions have a positive effect on bilateral trade flows. With regard to this line of research, we introduce as key factor the demographic structure of a country in terms of natives and immigrants/emigrants and study how the long run equilibria involving intraregional trade changes with the flows of immigrants and emigrants. Additionally, whether firms can discriminate consumer depending on their country of origin (determining their willingness to pay) or are forced to charge a uniform price is also considered.

The **first essay (Chapter 2)**, tries to overcome the problem of the lack of statistical information of domestic trade flows of services setting a methodology that can be used in other countries in order to obtain estimations of the interregional trade of services through a similar procedure. This essay focuses on three sectors (Accommodation, Restaurants and Travel Agencies) related with tourism activity that indicates the need to consider the characteristics of each service separately at the time that one methodology is proposed. In addition, it is studied the general structure of the bilateral flows according to

the gravity model and how factors affect in a different way the flows generated by overnight stays or trips in different types of accommodation.

In this paper, we present the largest estimate of the intra and interregional trade flows of these three service sectors ever obtained in Spain, which has been developed in the context of the C-Intereg Project (www.c-intereg.es). The methodology for the estimation takes into consideration the main statistical sources at hand regarding production, international trade, trip expenses and overnight stays of Spanish residents in each of the 18 Spanish regions (Nuts 2), the lowest spatial scale available. Through this methodology a considerable large series of interregional flows are obtained for the period 2000-2009, detailed by origin and destination and type of establishment or trip. The sectors that have been considered are Accommodation, Restaurants and Travel Agencies considering the characteristics and the idiosyncrasies of each sector. Through this dataset, we perform a series of analyses oriented to identify the territorial structure of the domestic trade in these sectors, as well as its temporal evolution in relation with the main markets (intraregional, interregional and international). Later, taking advantage of the multilateral dimension and the availability of the temporal horizon of the generated dataset, we develop the econometric analysis of this novel dataset based on the gravity model. This analysis allows us to identify some factors that can explain the intensity of the bilateral flows or the relative importance of some regions as origin or destination of some monetary flows. We also consider this analysis as a novelty with regard to the literature on trade of services and gravity equations, most of which has focussed on aggregate international flows.

According to a strand of the literature that calls the attention on the link between networks and trade flows, in the **second essay (Chapter 3)**, the positive effect of social and business network in Accommodation and Restaurants is studied. In order to test to what extent services responds in a different way to these links than goods do, an additional analysis for merchandises has been done. In this essay, according to Feenstra (2004) and Anderson and van Wincoop (2003) the multilateral resistance terms are controlled using fixed effects. The problem of heteroskedasticity is solved using the Pseudo Poisson Maximum Likelihood estimation shown in Santos-Silva and Tenreyro (2006). The results obtained show a heterogeneous effect regarding the social and business networks in each sector. While business networks have a larger effect on goods, social networks are more related with the trade creation of some services that cannot be provided by relatives or friends.

In the last empirical application-**third essay (Chapter 4)**, an additional source of links between trade flows and networks is confirmed by controlling for the spatial autocorrelation of the flows. One of the main innovations of this paper is that two types of neighbors have been defined: based on contiguity and demography. Estimates show evidence of spatial and social network dependence in the bilateral monetary flows of services related with tourism activity.

The results of Chapters 3 and 4 suggest that cultural/social ties may exert an important influence on destination trip decisions to overcome or reduce the traditional resistance role played by distance and that typically diminishes the magnitude of bilateral flows.

Another issue that has not been considered in the literature is the microeconomic consequences of the 'taste effect' that has been described in the literature as one potential source of explanation of the trade creation effect of social networks. In a **fourth essay (Chapter 5)**, we develop a first approximation to a model where the demographic structure of a country in terms of nationals and immigrants influences the trade flows, *i.e.*, the pro-trade effect of migration, as well as the pricing strategy of the firms, given that they may be able to discriminate across countries by setting a different price depending on their demographic characteristics (size, percentage of immigrants,…). In this essay we develop these ideas within a standard intraindustry trade model—based on the existence of scale economies and a monopolistic competition market structure—that takes into consideration all these factors that are normally avoided in the empirical works studying the trade creation effect of networks. Although in this theoretical paper I have been able to obtain relations between trade and demographic structures that have not appeared in the literature before, it should be considered as a work in progress. To this regard, in further research we expect to extend the analysis to a situation where we incorporate a constant elasticity of substitution (CES) utility function based on Dixit and Stiglitz (1977) that will allow us to make contact with the literature based on that framework, as well as empirical tests based on real data for the main hypothesis and conclusions obtained analytically. These reasons have motivated the location of this theoretical model in the last chapter, rather than at the beginning of the volume.

## 1.5. Final remarks

In this chapter the main characteristics and the importance of services have been pointed out. Although the services sectors account for almost three-quarters of the gross domestic

product in most countries, this magnitude is apparently reduced when we focus on the share of services on world trade. This is related to the defining characteristics of services with respect to goods already discussed; particularly the fact that services are not storable. Then, it is needed that consumers and producers locate together in order for the exchange to take place (modes 2, 3 and 4). As a consequence, it is expected that a higher share of services is consumed in the territory where it is produced.

Departing from these ideas, which have extensively been commented in the literature on international trade of services, it is interesting to wonder if the same situation holds for interregional trade of services within a country. To this regard, if the literature on internal border effect has found that around of 80% of the production is consumed within each country; we might expect a higher percentage for services. In a nutshell, if services have been proved recently to be as tradable as goods, how tradable are they within a country, that is, considering an interregional framework.

In this dissertation, I shed some light on this general questions estimating and analyzing the Spanish case for three specific service sectors: Accommodation, Restaurants and Travel Agencies. First I describe a methodology to obtain the interregional flows of these three sectors linked with the tourism activity in Spain, which are very related with the cross-border movement of people within the country. Then, these flows are used to replicate (and improve) in the interregional context some interesting results obtained in the context of international trade of goods and social and business networks.

Although this dissertation consists in four essays, there are some additional papers and professional reports (that do not form part of this thesis) that have been developed in parallel, and which constitute a set of related analyses that complement those presented here. In this work alternative settings have been considered, both at the statistical, model and econometric levels. The main references of this supplementary material will be provided in a separately volume together with the Doctoral Thesis and the Curriculum Vitae.

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# 2. How tradable are non-tradables? Measuring interregional flows of Accommodation, Restaurants and Travel Agencies in Spain

## 2.1. Introduction

Services have traditionally been considered as non-tradable goods. During decades, the economic activity produced by the services sectors has been largely considered as 'intra-national'. As we have reviewed in the first chapter, both weaknesses on the field of trade theory as well on the development of proper statistics is behind this fact. Of course, it can be also argued that this lack of theoretical and statistical progress in the field is just a result of the traditional lower level of international exports of services with regards to its output in comparison to the corresponding for merchandise. Although the label of "non-

tradability" of services in the international trade is being revised after the globalization process and the boom of trade in different modes of delivery (see Chapter 1 for a brief review), –in theory- its lower "tradability" can be questioned as lower spatial scale economies such as regions, provinces, or even cities within countries, are considered. As it was commented before, if one of the main reasons to consider the traditional low tradability of certain services in the international market is the "*proximity burden*" and the restrictions for the movement of people (migration, tourism and commuters) and capital (FDI) between countries, one may expect to find a higher level of "tradability" in services within a country, where the displacements of people and the interaction of capital between regions is much common.

Unfortunately, this intuition cannot be tested in most of the countries because of an almost complete lack of statistical information on intra-national trade flows of goods and services. As it was advanced in the previous chapter, one of the main goals of this paper is in fact to try to overcome such limitation, obtaining and analyzing a novel dataset that collects domestic monetary flows of three services sectors ('*Accommodation'*, '*Restaurants and the like'* and '*Travel Agencies')* in Spain for a reasonable large period of time (10 years; from 2000 through 2009).

Then, the main characteristics of the dataset obtained are analyzed using the gravity equation, the work-horse for most part of the analysis explaining international and interregional bilateral trade of goods

The first empirical applications of the gravity equation in economics took place in the 60s (Tinbergen, 1962; Pöyhönen, 1963; Pullianen, 1963; Linnemann, 1966)[1]. However, it was not until 1979 when Anderson (1979) provides a microeconomic foundation for this equation, whose empirical performance is surprisingly successful. The gravity equation is grounded on the basis that economic masses determine trade flows. Then, Bergstrand (1985, 1989, 1990) highlighted and developed a relationship between trade theory and bilateral trade including explicitly the supply side of the economy and giving attention to the price index terms. Finally, Anderson and van Wincoop (2003) has become the main reference for empirical applications using gravity models because they endogeneized prices, ending with the result that the bilateral trade flow between two countries also depends on a price index compound by the rest of the countries, labelled the 'multilateral resistance' terms. These terms originating from theoretical developments were not included in the analysis until that moment. According to Anderson and van Wincoop

[1] Although the model can be applied to many kinds of interactions in space as they are trade flows, transportation or immigration (Sen and Smith, 1995; Roy and Thill, 2004), I will primarily focus on the applications involved bilateral trade flows.

(2003), bilateral trade between two countries or regions does not just depend on the bilateral variables regarding the two territories involved in the exchange, but also on the characteristics of the rest of the regions or countries.

In the specific field of trade of services, as it has been pointed out by Francois and Hoekman (2010), due to data limitations, gravity estimates has concentrated mainly on international total trade for the world or a number of high-income countries. With this regard, classical examples on the use of gravity equation for services are Sapir and Lutz (1980, 1981), which analyzed data from the balance of payments (total), or Francois (1993), who worked with early U.S. bilateral flows. More recently, Ceglowsky (2006), analysed by means of the gravity equation the bilateral trade flows of services using the OECD database for the years 1999 and 2000. He proved that the intensity of bilateral trade in services had a greater negative elasticity with respect to distance than the one observed for goods. Similar results are obtained by Kimura and Lee (2006), also from the analysis of monetary flows of international services with the same database and also using a gravity model.

These first attempts based on aggregate data on trade of services are relevant, but lack on considering services as homogeneous (Francois and Hoekman, 2010), without considering idiosyncratic characteristics for specific sectors or modes of delivery. To this regard, Francois and Hoekman (2010) show a set of alternative results using gravity estimates based on a World Bank-sponsored dataset that combines bilateral trade data, aggregate trade data, service sector FDI stocks, and service sector FDI flows from different sources, for the 2004-2006 period. What is of interest for us, they estimate the model for 6 different sector specific flows for the first time.

Some papers have analysed the impact that distance has on the trade intensity of some specific services such as education and tourism. For example, Sa, Florax and Rietveld (2004) point to an inverse relationship between trade of education and distance. However, the results related to touristic services as the ones we study here seem to be less conclusive. The proximity between producers and consumers can be an advantage by saving transaction costs (time, transportation, business culture...), in many cases. By contrast, the psychology of tourists could be precisely to find those destinations that are "more different and exotic" within a given budget constraint. In this sense, although it is clear that the cost of transport and cultural proximity is able to justify the presence of gravity on tourism flows, one can also expect less influence of distance as an impediment to trade between two countries / regions sufficiently remote or heterogeneous.

Although the gravity equation has also been used in the field of tourism, the focus is mainly on explaining travel decisions and destination choices, modelling the trips themselves rather than the trade of services (monetary flows) linked to the trips (some examples can be found in Long, 1970; Gordon and Edwards, 1973; Malamud, 1973; Durden and Silberman, 1975; Witt and Witt, 1995; Imm Ng et al., 2007; Khadaroo and Seetanah, 2008).

All these studies have concentrated primarily on the analysis of international trips, paying little attention to domestic flows. Moreover, although there are some works analysing the domestic trade of goods (Anderson and Van Wincoop, 2003, Combes et al., 2005), it is very difficult to find any study on the interregional monetary domestic flows of services generated by the tourist activity which also takes also into account intraregional trade flows.

In the case of Spain, a smaller number of authors have estimated and analysed the domestic trade related with tourism (Largo Jimenez, 1976; Cañada, 2002; Millán Escriche, 2004). This number, however, further decreases, dramatically, when we look for multi-regional studies adopting a bilateral approach (Usach Domingo, 1998; Cañada, 2002). As with the international sphere, most of these studies focus their analysis on travel rather than monetary flows. In fact, if we want to find any information about the economic flows induced by the tourist sector at a regional level, we have to focus our attention to studies employing Regional Input/Output Tables and to occasional attempts to estimate the Regional Balances of Payments (Parellada, 1997, Mella and Sanz, 2001, 2003). Most of these works, once again, do not take into account the tourist trade taking place inside each region.

In our view, without neglecting the relevance of analysing travel decisions and trips of people, it is essential to emphasize the importance of the trade flows of services (monetary flows), as the former is a necessary condition for the latter, which is relevant economic variable, both at the international and interregional levels. First, we want to stress the idea that, in many countries, and definitely in Spain, a major concern of policy makers is not just the number of visitors and the length of their stays, but also the amount and type of their spending. The socioeconomic breakdown of the visitors and the types of establishment at which they stay may severely alter the effective economic impact of tourism, both in the origin and destination country or region. For example, in Spain, there is an open debate about the impact on tourist expenses of an observed-increasing- trend of substituting stays in hotels with stays in co-ownership apartments and second homes. Without looking at the controversial aspects of this trend, a better understanding of this

factor might be useful, considering that tourism accounts for a large share of the service sector. The majority of the literature on international and interregional trade of goods focuses on monetary flows rather than freight movement in tons. The importance of this perspective is connected with the well-known link between trade balance (in monetary units, namely euros,€) and the level of national net saving in an economy. By contrast, most of the analysis connected to the tourist sector tends to consider the movement of tourists rather than that of the monetary flows generated by them. Therefore, the chance to infer the macroeconomic consequences of the trips is missed.

In this chapter, we present the largest estimate of the intra and interregional trade flows of three service sectors linked to tourism activity as they are Accommodation, Restaurants and Travel Agencies, obtained in Spain, which has been developed in the context of the C-Intereg Project (www.c-intereg.es). The methodology of estimation takes into consideration the main statistical sources at hand regarding production, international trade, trip expenses and overnight stays of Spanish residents in each of the 18 Spanish regions (Nuts 2), the lowest spatial scale available. In summary, in the methodology proposed, the total Spanish production of the three sectors considered matches the actual production figure of National Accounts and the corresponding Input-Output framework, while their territorial structure takes as a baseline the production of the Annual Services Survey of INE according to the location of plants/establishments in these three sectors. Additionally, we have made a detailed estimate of the average unit costs for different types of services and types of stays, and we have used the most solid statistics available about overnight stays, trips and excursions made by Spanish residents, both within their regions of residence and the rest of Spain. In this paper, we are taking into consideration the activity of three sub-sectors (Accommodation, Restaurants and the like and Travel Agencies) classified as separated codes in the Spanish Annual Services Survey (SASS) published by the INE. We define as trade of any of these services the service provision in a region that is consumed by Spanish residents, whether living in the same region (intraregional trade) or in any other Spanish region (interregional flow). Consequently, it is important to highlight that we are including every service in the given categories (Accommodation, Restaurants and Travel agencies) demanded within each region, not necessarily only that linked to trips. Thus, following a “mixed top-down / bottom-up” procedure, which combines bottom-up[2] estimate figures for travel and overnight stays as

[2] The "top-down estimate" (top-down) methodology pursued a magnitude (i.e., regional GDP) from the breakdown of the same size available in aggregate (i.e., the national GDP). By contrast, in a "bottom up" (bottom-up) process, the regional GDP estimate will be made from available information on each of its components (consumption, investment ...) using the appropriate regional

well as official national and regional figures as constrain with regards to sectorial production and international exports for each industry. At the end of this process it is obtained for the first time in Spain a detailed estimate of the monetary intra and interregional trade flows for the 18 Spanish regions (Nuts 2) for the period 2000-2009 in these sectors. This estimate provides the detailed bilateral monetary flows consistent with the whole expenditure statistics and movement of passengers within Spain, and it is compatible with the whole production and demand figures from National Accounts and Balance of Payments.

Then, departing from this novel dataset, a descriptive geographical analysis is conducted with the aim of identifying the territorial structure of the domestic trade in the sectors, as well as its temporal evolution in relation with the main markets (intraregional, interregional and international). Afterwards, taking advantage of the multilateral dimension and the availability of the temporal horizon of the generated dataset, we will develop the econometric analysis based on the gravity model. This analysis allows us to identify some factors that can explain the intensity of the bilateral flows or the relative importance of some regions as origin or destination of some monetary flows. We consider this analysis as a novelty with regard to the short literature on trade of services and gravity equations, most of which has focussed on aggregate international flows.

From the descriptive analysis of the patterns of the flows strong intraregional flows in respect to the interregional ones are obtained. When the distribution of the interregional bilateral flows are strictly analyzed, we got that a large share of the interregional exports take place from the coastal regions in the south-east and the islands to rich and highly populated regions. Furthermore, as we will see in Chapters 3 and 4, these drivers of trade of these three services are also enhanced by social and business networks.

The patterns of the domestic flows are found to be very stable over the period 2000-2009. However, some heterogeneity in the behavior of the flow in respect to the distance by sector is found. To this regard, a strong density of flows in short distances that after 200 Km seems to become almost flat is found for 'Restaurants and the like' (even when the intraregional flows not linked to trips are dropped from the analysis). However, for the Accommodation sector, although the same agglomeration for short distances is found, after a certain number of kilometers a second agglomeration is found in line with the hypothesis that for a certain type of trips or type of establishment, further regions could

indicators (household expenditure, government expenditure, exports ...). Finally, procedures called "mixed" are those that make a "bottom-up" estimate but ensure consistency between the obtained and the aggregate amount available nationwide.

be chosen. This is related to the trips from Madrid to coastal regions as Comunidad Valenciana and Cantabria, Asturias and Pais Vasco that are between 325 and 500 far from Madrid. These results have been confirmed with different analysis by region and type of establishment.

The structure of the chapter is the following: in section 2, we describe the methodology used to estimate the bilateral flows of accommodation, restaurants and travel agencies for the period 2000-2009. A brief descriptive analysis has been done in section 3 with the aim of identifying some characteristics and regularities of the estimated dataset. Then, in section 4 we introduce the gravity equation as the proper framework to analyse the factors influencing bilateral trade flows. The results for the total flows are presented in section 5, while a robustness analysis using the pseudo poisson distribution suggested in Santos-Silva and Tenreyro (2006) in performed in section 6. A brief regional analysis is carried out in section 7, and by type of establishment in section 8. Section 9 concludes.

## 2.2. The dataset: a novel compilation on internal trade of services

In the outset, we should start noting that in Spain, like in most countries, there are not official estimates on the intraregional and interregional trade flows of goods and services. Consequently, the dataset to be build will be based on the available information at the national and regional level, as well as on several methodological assumptions. Before entering on the description of the process of estimation, some clarifications are needed.

We are considering the sectors of Accommodation, Restaurants and Travel Agencies as they appear in the Spanish Annual Services Survey (SASS) published by the INE (Spanish National Institute). Therefore, although our sectors are clearly related with "tourism", we do not consider other expenses done by travellers in other service sectors such as Retail, Transport, Education, etc., which might be consider in alternative definitions of "Travel" or "Tourism" considered in other type of statistics. Therefore, our three sectors coincide with the grouping of activities of the SASS, but partially diverge from the one used for Travel in the Balance of Payments (BOP) or Tourism of the Spanish Tourism Satellite Accounts (TSA)[3]. Likewise, in this article we refer to domestic trade when designating the provision of services in any of the three sectors mentioned when the producer and the consumer

[3] Readers interested in a detailed discussion on alternative accounting methods for trade of services are forwarded to UN (2011).

are Spanish residents. This domestic trade will be intra-regional if the producer and the consumer reside in the same region[4], and inter-regional, if they reside in different ones.

### 2.2.1. Estimation method

Schematically, the methodology used for the estimation of the domestic trade of Accommodation, Restaurants and Travel Agencies in each of the 10 years considered (2000-2009) can be summarized in two steps:

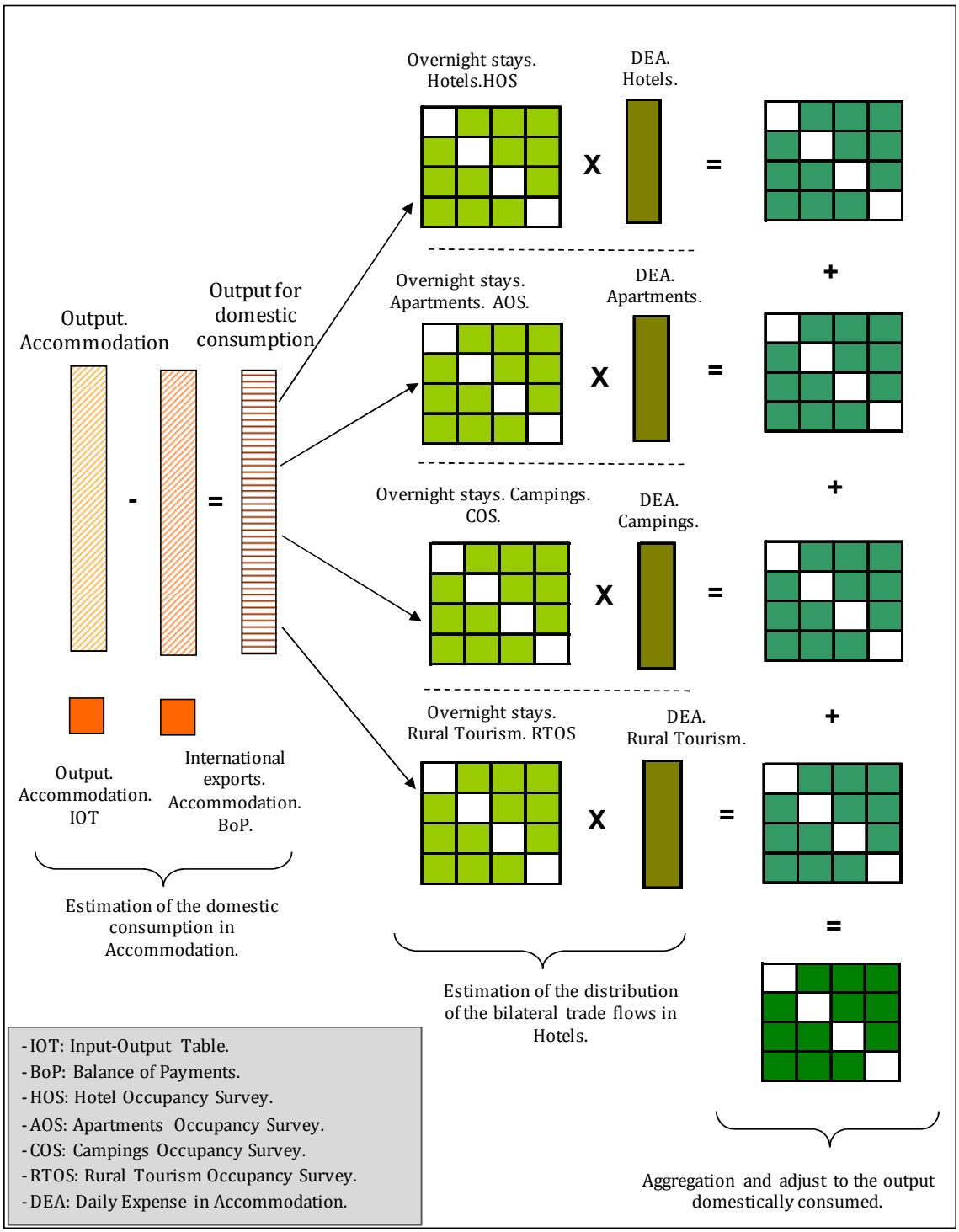
a) Obtaining the regional output consumed by Spanish residents; that is, not that internationally exported, for each sector.

b) Determining the bilateral distribution of interregional flows for each sector.

The whole process of estimation is schematically presented in **Figure 2.1** (Accommodation) and **Figure 2.2** (Restaurants). Next, we offer a more detail description of the variables used and the assumptions that have to be taken when the required information is not available.

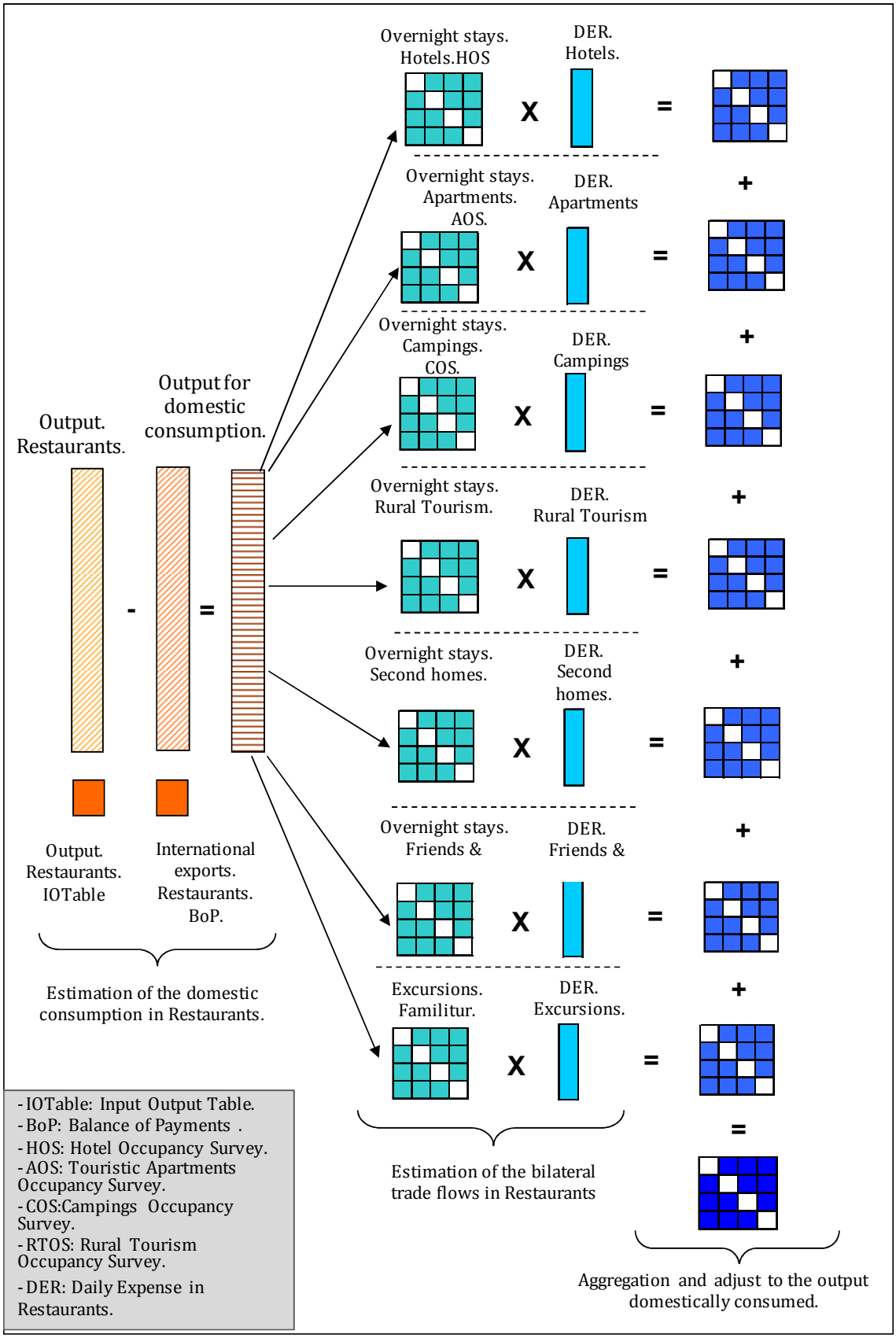
[4] This definition of intraregional trade is in contrast with the concept of "domestic touristic expenditure" of the Tourism Satellite Accounts. We are including as intraregional the expenses in Restaurants and the like realized within the normal environment that is part of the non-touristic demand of this sector according to the Tourism Satellite Account methodology.

**Figure 2.1. Methodology for estimating the bilateral domestic flows for each year. Accommodation.**




Plain colors represent official data, while dotted charts are estimated data. For simplicity, the graph omits intermediate steps.

**Figure 2.2 Methodology for estimating the bilateral domestic flows for each year. Restaurants**




Plain colors represent official data, while dotted charts are estimated data. For simplicity, the graph omits intermediate steps.

### 2.2.2. Obtaining the regional output domestically consumed

To obtain the *Regional Output Domestically Consumed* in the three sectors considered ( $PDI_{it}^{s}$ ), we depart from the information offered by the National Input-Output Tables (NIOT) and the SASS published by the INE (eq.1- eq.4). The national output for each sector taken from the NIOT ( $P_{t(CN)}^{s}$ ) is regionally distributed using the structure of the SASS (with the breakdown at the establishment level), in such a way that we obtain a *Regional Output* for each sector (s) and year (t) ( $P_{it}^{s}$ ) (eq. 1). Then, we subtract a vector containing the *International Exports* ( $Exp_{it}^{s}$ ) (eq. 2). In order to obtain the international exports of each region we have to correct the figure of "*Travel*" from the Balance of Payments ( $TExp_{t(BP)}$ ), taking away the share that does not correspond to the international exports in Accommodation, Restaurants and Travel Agencies. We make use of the sectoral structure of the incoming tourist consumption of the Tourism Satellite Account (TSA). This figure is regionalized according to the importance of each region in the aggregate of *Expenses of Foreign Tourists* ( $Exp_{it(EGATUR)}$ ) given by EGATUR (eq. 3). Lastly, we have assigned the regional exports in each sector according to the sectoral structure of each region (eq. 4).

$$P_{it}^{s} = P_{t(IOT)}^{s} * \frac{P_{it(SASS)}^{s}}{\sum_{i=1}^{18} P_{it(SASS)}^{s}} \tag{1}$$

$$PDI_{it}^{s} = P_{it}^{s} - Exp_{it}^{s} \tag{2}$$

$$Exp_{it} = TExp_{t(BP)} * \frac{\sum_{s=1}^{3} Exp_{t(TSA)}}{TExp_{t(TSA)}} * \frac{Exp_{it(EGATUR)}}{\sum_{i=1}^{18} Exp_{it(EGATUR)}} \tag{3}$$

$$Exp_{it}^{s} = Exp_{it} * \frac{P_{it(SASS)}^{s}}{\sum_{s=1}^{3} P_{it(SASS)}^{s}} \tag{4}$$

Where i=1,…, 18 represent each of the 18 Spanish regions, and s=1,…, 3 is each of the 3 service sectors considered.

### 2.2.3. Obtaining the bilateral distribution of the interregional flows

***Previous considerations***

In order to obtain the bilateral distribution of the interregional trade flows it is important to think about the characteristics of each sector: on the one hand, we assume that the expenses in "Accommodation" and "Restaurants" industries take place in the destination region of the trip (origin of the monetary flow, that is, the exporting region), which can coincide or not with the travelers' residence. So, the bilateral distribution of the flows will be related with the overnights or displacements of the residents from his region of residence to the others. On the other hand, the expenses in "Travel Agencies" are assumed to take place in the region of residence (destination of the monetary flow). As we are focusing on the location of the establishments and the place of residence in this case, the geographical origin and the destination of the monetary flow is the same, and all the expenses for Travel Agencies is considered as "intra-regional". [5]

The output of the Accommodation sector will be related to overnights in regulated establishments, while expenses in Restaurants are linked to excursions and overnights, both in regulated and non-regulated establishments. Furthermore, there is an important part of the production of Restaurants that is consumed on daily basis by residents in the same region where the establishment is settled. Therefore, this trade is considered as intraregional.

Then, in order to estimate the intra and interregional trade flows of the Restaurant sector, we set out a methodology that combines the available information on the interregional displacements of Spanish residents within Spain, considering excursions, trips and overnights (from the INE and Instituto de Estudios Turísticos), with the available information on the expenses made in such displacements by region and type of stay. However, the consumption done in Restaurants that is not linked to trips nor to overnights is obtained as a residual between the production consumed by Spanish residents and the domestic trade in Restaurants linked to trips. In that sense, interregional flows of

[5] This is in line with the fact that according to the Tourism Satellite Account in Spain, less than 8% of the consumption of the travel agencies in Spain takes place within the country, not internationally exported. According to this situation, we expect that a similar situation would apply for the regions in Spain and that most of the output is consumed within the region where the establishment is located.

Restaurants is directly estimated using a "bottom-up" procedure, while the intraregional flows are obtained as a residual.

***A bottom-up method to obtain interregional trade flows***

Taking into account all the particularities and the statistical information available for each sector and type of consumption, the estimation process can be summarized in the following steps.

**Step 1. Obtaining interregional trips (overnights and excursions).**

Departing from the *Occupancy Surveys* (INE) and *Familitur* (Instituto de Estudios Turísticos, IET), six origin and destination matrices of interregional overnights are built, differentiating between the six types of establishments in which the overnight stay takes place (hotels, apartments, camping, rural hotels, second homes; homes belonging to friends and relatives). Analytically, we use the term ( $N^{e}_{jit}$ ) to denote *bilateral overnights* in year *t* of travellers with residence in region *j* who travel and spends the night in region *i*, where *e* denotes the type of establishment for the overnight stay. Additionally, we have one *origin and destination matrix of interregional excursions* ( $N^{e=excursions}_{jit}$ ).

**Step 2. Obtaining region specific prices for Accommodation and Restaurants**

For each year *t*, we obtain a set of regional price vectors both for Accommodation and Restaurants and the like sectors. These prices are computed as average price by overnight or trip in the exporting region; that is, the region of destination of the trip (i). For the Accommodation sector, the *average price by overnight* in regulated establishments (hotels, apartments, camping, rural hotels) is denoted by $Pa^{e}_{it}$. Subscripts *i* and *t* indicate that different regional prices are considered for each year (*t*), while the prices applied to the trips are the ones that correspond to the destination region of the trip, that is, the exporting region of the service. The superscript (*e*) indicates that the prices are different depending on the type of establishment where the overnight takes place. The regional-specific prices for each regulated type of establishment ($Pa^{e}_{it}$) are obtained from the Occupancy Surveys (INE) that collects several price indexes: Hotel Price Index, Tourist Campsite Price Index, Holiday Dwelling Price Index and the Rural Tourism Accommodation Price Index. Clearly, excursions and overnights in non-regulated establishments (second homes, and houses owned by friends and relatives) do not have a corresponding price vector, since they do not produce any economic activity included in

the Accommodation sector in the National Accounts. However, these trips are very important with regard to interregional expenses in Restaurants.

The average expense in Restaurants is taken from the official survey used in Spain to obtain the Purchase Parity Power making different assumptions regarding the daily expenses in Restaurants by region and type of accommodation[6]. Similarly, the *average expense by overnights and excursion for Restaurants* is denoted by ($Pr^{e}_{it}$). Note that conversely to the case of ($Pa^{e}_{it}$), the superscript (*e*) includes excursions and regulated and non-regulated type of establishments, since we consider that there is certain expending in the Restaurant sector in all type of trips.

**Step 3. Obtaining bottom-up estimates of intra and interregional trade flows**

Then, as it is described in equations (5) and (6), for each year *t*, two sets of origin-destination *matrices of interregional flows of services* for Accommodation and Restaurants, with elements $Fa_{ijt}$, $Fr_{ijt}$ respectively, are obtained by multiplying the overnights and excursions by the corresponding price vectors. We want to remark again that each type of trip will produce Accommodation and Restaurant services, depending on the specific prices for Accommodation ($Pa^{e}_{it}$) and Restaurants ($Pr^{e}_{it}$) for each region and type of trip and establishment. Note that in the case of Accommodation, just the regulated establishments will produce trade of services (therefore $Pa_{it}^{e=non\_regulated\_establishments}=0$)

$$Fa_{ijt}=\sum_{e} N^{e}_{jit} Pa^{e}_{it} \tag{5}$$

$$Fr_{ijt}=\sum_{e} N^{e}_{jit} Pr^{e}_{it} \tag{6}$$

***Obtaining final intra and interregional trade flows of services***

Finally, in order to ensure the correspondence between the bottom-up estimates and the macroeconomic figures described in section 2.1.1, the former estimates are proportionally adjusted to the vector of production that is domestically consumed. In order to distinguish

[6] We assume that three meals and three bottles are consumed each day when the overnight is in a hotel, and 75% of this figure for the rest of the regulated establishments, and 50% for non-regulated establishments and excursions. We have also looked at the data given by other sources in tourism studies (Familitur or Familiar Budget Survey) but the data reported is less coherent and with a huge variability across regions, so it has been discarded.

between bottom-up estimates and the final ones, which have been harmonized with macroeconomic figures, we use an alternative notation such as $Ta_{ijt}$ for *Accommodation* and $Tr_{ijt}$ for *Restaurants*.

For the *Accommodation* sector, the harmonization is described by equation(7):

$$Ta_{ijt} = PDI_{it}^{s=accommodation} * \frac{Fa_{ijt}}{\sum_{j=1}^{18} Fa_{ijt}} \quad (7)$$

In the case of *Restaurants*, the final trade flows are obtained as follows:

a) As it is described by equation(8), interregional flows of the Restaurants and the like sector will coincide with the bottom-up estimates:

$$Tr_{ijt} = Fr_{ijt} \text{ if i≠j} \quad (8)$$

b) Conversely, the intraregional flows will be obtained as a difference between the production that is consumed by Spanish residents in the Restaurants and the like sector, and the aggregate of interregional flows generated by the trips and overnights (sum along the rows of the interregional flows obtained using the bottom-up procedure).

$$Tr_{iit} = PDI_{it}^{s=restaurants} - \sum_{i \neq j} Fr_{ijt} \quad (9)$$

Finally, as it is described in equation (10) the *aggregate bilateral trade flows* $T_{ijt}$ for the three service sectors (s) considered is obtained by the aggregation of the intra and interregional flows for Accommodation ($Ta_{ijt}$) and Restaurants ($Tr_{ijt}$), as well as the pure intraregional flows obtained for Travel Agencies which are contained in the diagonal matrix $Tta_{ijt}$ [7].

$$T_{ijt} = Ta_{ijt} + Tr_{ijt} + Tta_{ijt} \quad (10)$$

Summing up, after this process, a complete estimate of the intra and interregional trade flows in monetary units for these three service sectors are obtained for the whole period 2000-2009. The attractiveness of this dataset is twofold: first, it has been built using a

[7] $Tta_{ijt}$ is a diagonal matrix that contains in the main diagonal the intraregional consumption of the sector of travel agencies-whose value coincides with the regional output of this sector not exported internationally-, and zeros out of the main diagonal because this is an expense mainly done in the region of residence.

bottom-up approach with data at the highest available level of disaggregation, both at the spatial and type of overnight dimensions; second, it includes the corresponding adjustments to assure coherence with the main macroeconomic figures, such as the production and international trade data obtained from the National Accounts-Input Output Table (IOT), the Spanish Annual Services Survey (SASS), the Tourism Satellite Account (TSA) and the Balance of Payments (BOP).

## 2.3. Descriptive analysis of the domestic trade of touristic services (2000-2009)

This section contains a brief descriptive analysis of the trade flows of services obtained in the previous section for the period 2000-2009. The analysis focuses on the main trends observed regarding the intensity and direction of the flows and their spatial pattern.

Firstly, it is important to notice the importance of the Restaurants among the three sectors considered, which represents 74% of the total aggregate output. As we will see in the next sections, the relevance of the Restaurant sector in the whole will be remarkable when spatial patterns of trade are analysed, because a significant share of the output of the Restaurant sector is explained by the daily consumption by residents (intraregional trade) and it is not linked to the trips, excursions and overnights (non-touristic expenses, in Tourist Satellite Accounts terminology). The importance of the normal daily consumption in Restaurants will be reflected in the rate between inter and intraregional flows.

With the aim of analysing the structure of the output of the three service sectors considered here, **Table 2.1** contains the regional distribution obtained in the main markets (intra, interregional and international) for 2009. The total sum of intraregional flows (98.523 millions of Euros) and the interregional ones (20.484 million of Euros) of the three service sectors considered is clearly larger to the one of the international exports (17.416 million of Euros). In fact, international exports just reach the small figure of 13% of the national output (intra + interregional + international) corresponding to the aggregate of the three sectors. In order to remark the relevance of this enormous share of the domestic market, it is important to consider that Spain is always between the second and third position in the World's ranking of international tourism, competing with France, Italy and the United States[8].

[8] In order to interpret correctly this result it is important to highlight that we are just including expenses in "Accommodation", "Restaurants" and "Travel Agencies", while expenses in other

**Table 2.1. Territorial distribution of trade in the aggregate of Accommodation, Restaurants and Travel Agencies. Millions of euros. 2009.**

| | Own region | | Exports to | | Imports from | | Balance | |
|---|---|---|---|---|---|---|---|---|
| | | | Spain | World | Spain | World | Spain | World |
| | (1) | (1*) | (2) | (3) | (4) | (5) | (6)=(2-4) | (7)=(3-5) |
| **Andalucía** | 13,663.57 | *9,140.76* | 2,479.25 | 3,103.23 | 1,848.91 | 515.27 | 630.34 | 2,587.96 |
| **Aragón** | 2,721.05 | *2,161.94* | 628.47 | 179.04 | 636.71 | 133.63 | -8.23 | 45.41 |
| **Asturias** | 2,406.36 | *1,906.27* | 459.74 | 106.48 | 562.50 | 118.26 | -102.76 | -11.77 |
| **Baleares** | 3,794.72 | *2,398.49* | 2,229.66 | 2,512.42 | 296.74 | 142.54 | 1,932.91 | 2,369.88 |
| **Canarias** | 5,828.24 | *3,558.75* | 2,859.83 | 2,104.41 | 318.78 | 218.81 | 2,541.05 | 1,885.60 |
| **Cantabria** | 1,052.88 | *858.07* | 494.91 | 155.12 | 291.55 | 76.26 | 203.35 | 78.86 |
| **Castilla y León** | 4,497.34 | *3,717.20* | 1,574.00 | 311.56 | 1,111.49 | 113.92 | 462.51 | 197.64 |
| **Castilla-La Mancha** | 2,832.70 | *2,401.32* | 943.28 | 95.70 | 792.27 | 223.22 | 151.01 | -127.52 |
| **Cataluña** | 18,715.23 | *13,456.41* | 1,858.46 | 4,081.84 | 2,622.48 | 1,401.46 | -764.02 | 2,680.39 |
| **Com. Valenciana** | 8,709.25 | *6,645.75* | 2,281.74 | 1,620.40 | 1,482.95 | 437.03 | 798.79 | 1,183.37 |
| **Extremadura** | 1,290.37 | *1,062.69* | 437.65 | 61.58 | 416.09 | 70.36 | 21.57 | -8.78 |
| **Galicia** | 4,965.00 | *3,999.73* | 682.45 | 333.12 | 701.35 | 228.25 | -18.90 | 104.87 |
| **Com. de Madrid** | 18,124.62 | *14,234.13* | 1,988.40 | 2,091.86 | 6,832.55 | 1,275.88 | -4,844.15 | 815.98 |
| **Región de Murcia** | 2,166.92 | *1,798.59* | 463.74 | 307.43 | 429.11 | 145.56 | 34.63 | 161.86 |
| **Navarra** | 1,357.79 | *1,098.35* | 319.25 | 69.00 | 358.23 | 80.44 | -38.98 | -11.45 |
| **País Vasco** | 5,664.28 | *4,930.79* | 536.99 | 257.10 | 1,491.51 | 283.92 | -954.53 | -26.83 |
| **La Rioja** | 620.78 | *532.41* | 176.15 | 22.12 | 201.39 | 43.46 | -25.24 | -21.34 |
| **Ceuta y Melilla** | 166.93 | *150.66* | 70.13 | 4.55 | 89.49 | 13.18 | -19.36 | -8.64 |
| **Total** | 98,578.04 | *74,052.33* | 20,484.12 | 17,416.95 | 20,484.12 | 5,521.46 | 0.00 | 11,895.49 |

Source: own data estimated in coherence with official figures from Input-Output Tables, SASS (NSI), Familitur (ITE) and Occupancy Surveys (NSI).
(1) Total Intraregional; (1*) Intraregional in Restaurants not linked to trips or overnights stays. The intraregional linked to trips or overnights stays can be obtained as the difference between (1) and (1*).

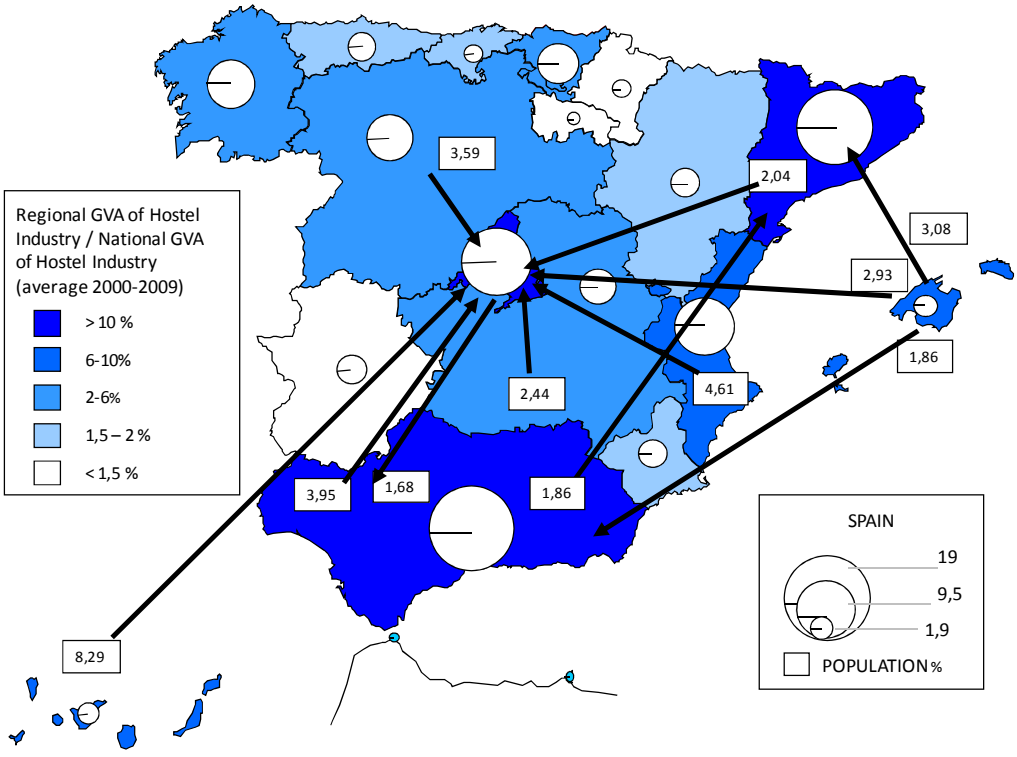
Analyzing the figures for each region, it is observed that in every region the sum of intra and interregional exceeds the international exports. Indeed just the intraregional trade is larger than the international exports in every region. Again, the relevance of this fact lies in the habit of identifying the activity of these three touristic sectors with the "non-residents expenses", paying little attention to the higher share of the consumption that is done by Spanish residents, especially those who live in the same region. This fact is useful to emphasize the idea that even in the more internationalized economic activities, distance impedes trade (gravity effect), making domestic flows larger than international one.

When we analyze this data in terms of their evolution during the period 2000-2009, it is observed that while the output of the three sectors has increased 73%, the intraregional trade 88% (99% the part of intraregional linked to trips; 88% the part of intraregional not linked to trips), the interregional trade 100%, and the international exports just 7%[9].

sectors (transport, retail, car renting…), connected with the "Tourist sector" or the "Travel" denomination in the National Balance of Payment, are not included in our analysis.
[9] If instead of considering the increase with respect to year 2009, we consider 2008 as reference, the increasing of international exports in the period 2000-2008 is 20%.

Finally, **Figure 2.3** describes the main bilateral flows for the three activities in percentage of the total interregional flows for 2009. The main interregional importing region is the Comunidad de Madrid. Some characteristics that can be behind this fact are its small size, its higher income per capita and its geographical location, given that it is in the center of the Iberian peninsula and draws together a high number of infrastructure that make easier to travel to different regions. The larger imports of the three services into the Comunidad de Madrid were produced and exported by contiguous regions such as Castilla y León and Castilla – La Mancha, as well as coastal regions such as Andalucía, Comunidad Valenciana, Cataluña or the islands. In addition, the large trade flows exported by the Islas Baleares to Cataluña are also remarkable; a flow that can be explained by the high touristic attractiveness of the islands, and the proximity between the two regions, both geographical and cultural. Finally, it is also important to notice the exports from Madrid and Baleares to Andalucía. This is related with the size of the latter.

**Figure 2.3. Main bilateral flows (% over the total interregional flows). 2009**




Source: Own elaboration using IOTable, SASS (INE), Familitur (IET) y Occupancy Surveys (INE).

Next, following some recent works (Hillberry and Hummels, 2008; Llano-Verduras et al., 2011; Garmendia et al., 2012), we analyse the distribution of trade of services with regard to the distance travelled by the tourist when consuming services from Restaurants,

Accommodation and Travel Agencies in Spain. For this purpose, we use a set of kernel regressions to provide non-parametric estimates of the relationship between average distance and the intensity of the Spanish regional trade flows of services, considering alternative flows and units[10]. The first analysis explores the time dimension of the dataset, focusing on the distribution of the aggregate flows in monetary units considering each year of the sample. **Figure 2.4** plots the kernel distribution of the bilateral flows in monetary units for consecutive years in the overall period 2000-2009, showing the dynamics of the Spanish region's propensity to trade these services with further locations, that is, a first glance on *"how tradable are non-tradables"* sectors within a country such as Spain.

**Figure 2.4** is divided in three panels: **Panel A** plots the kernel distribution obtained for the aggregated bilateral flows of the three service sectors considered (Accommodation, Restaurants and Travel Agencies) with regards to the distance. The shape of the distribution is similar for all of the 10 years explored, and basically coincides with the one observed in previous papers based in the inbound distribution of trade of goods within a country such as the US (Hillberry and Hummels, 2008) or Spain (Llano-Verduras et al., 2011; Garmendia et al., 2012). In our analysis, like in the two papers cited, the intensity of bilateral trade of services decreases dramatically within the first frame of 300Km. This result suggests the presence of a great gravity effect, which in our view is explained by three main reasons: first, the relevance of the Restaurant sector, and the daily expenses not linked to trips; second, the intra-regional nature of the Travel Agencies sector[11]; third, apart from these previous factors, singular in nature, as we will see in the next graphs (**Figure 2.5** and **Figure 2.6**), even when they are removed from the aggregate there is still a huge agglomeration of trade flows in the shortest distance due to a pure gravity effect, which tends to concentrate short trips and excursions within the own region (intra) or to contiguous ones. In addition, it is worth mentioning a slight increase of the density of trade at a large distance (1,500-1,800 Km), which in the Spanish case, is associated with the strong interregional monetary flows of these services associated with exports from the coastal regions (mainly the islands) to the landlocked/richer regions in Spain. It is remarkable that the distribution of trade over distance is very stable in time. Note that the lightest lines correspond to the most recent years; although they show an increase in the

[10] We use the Gaussian kernel estimator in STATA, allowing for n=200 points, and allowing the estimator to calculate the optimal bandwidth.

[11] In the appendix we show the kernels regarding the evolution of the total flow (Accommodation, Restaurants and Travel Agencies), the sector of Restaurants without the consumption in Restaurants that is not linked to trips, and also the total flow without travel agencies nor the share of the consumption in Restaurants not linked to trips.

volume of trade (the softest the colour the higher the intensity of trade), the distribution of this growing trade seems to be equitably distributed for every distance (in line with the similar growth rates of the intraregional [99%] and the interregional flows [100%] reported before).

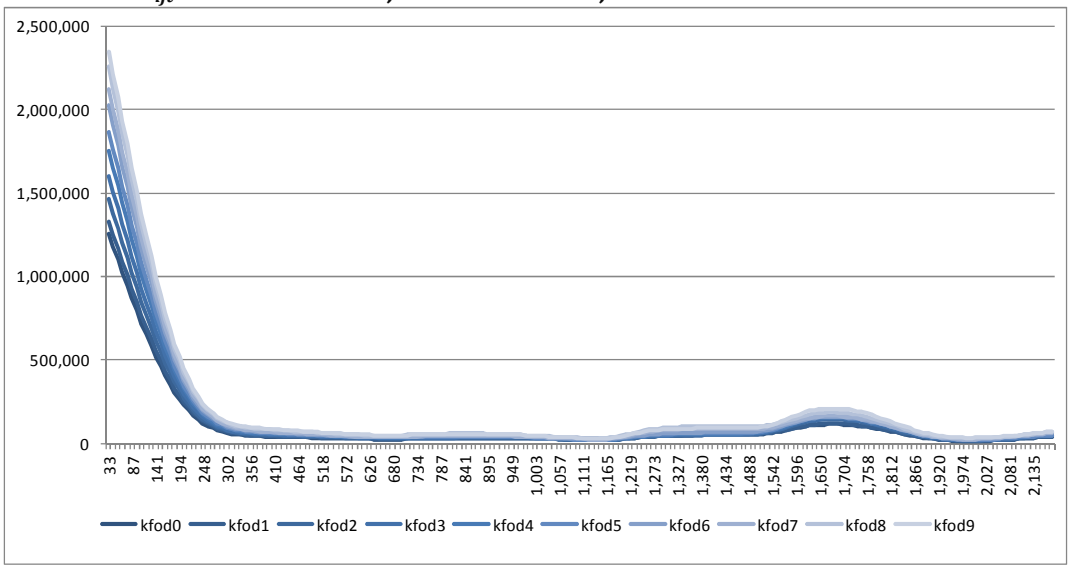
In order to dig deeper in the time dimension, **Figure 2.4 Panel B** plots the kernel distribution of the monetary flows produced by the Restaurant sector alone, while **Panel C** does the same for the monetary flows of the Accommodation sector. Regarding **Panel B**, the distribution of the bilateral trade flows of Restaurants within the country shows a clear agglomeration pattern in the shortest distance, and a flat distribution in the rest. As it was suggested before, this effect is derived from the daily expenses in Restaurants and the like, but also the strong accumulation of trade flows of this service due to excursions and short but frequent trips during the weekends.

By contrast, the spatial distribution of the bilateral flows associated to the Accommodation sector (**Panel C**) exhibits a completely different shape, which in fact does not mirror anything that, to the best of our knowledge, has been reported before in the literature. In this case, although there is an intense agglomeration of trade flows of services in the shortest distance, the fall in the intensity of trade with distance is not as sharp as in the case of Restaurants (or goods), and even register a strong increase for considerable large distances (1,500-1,800 Km), when considering the Spanish geographical scale. Moreover, this singular distribution of trade of services is markedly repeated in the 10 years considered, suggesting the idea of persistence and some structural relationships between farther regions. Although this peculiar trend needs to be analysed more carefully by an econometric model able to control for other factors, we can now offer some explanations: first, as it was suggested in the introduction, there is an *"escape from daily life and routine"* effect, assuming that a large part of the internal overnights are associated with leisure, tourist may try to travel to further destinations looking for different features (amenities, weather and lifestyle) to the ones found at home; second, the intensity of the flow may increase with the differences between the per capita income levels of the exporting and the importing regions. In order to explain this, we may want to consider that due to spillover effects, highly rich industrialized regions (at the Nuts 2 level), tend to be surrounded by also rich-industrialized regions, which may not offer enough attractive/differentiated touristic supply for national visitors, compared to the one offered in other regions, which may be far away, but could offer less spoiled natural resources (mountain, coast) and cheaper prices. Finally, related to the latter comment, the monetary

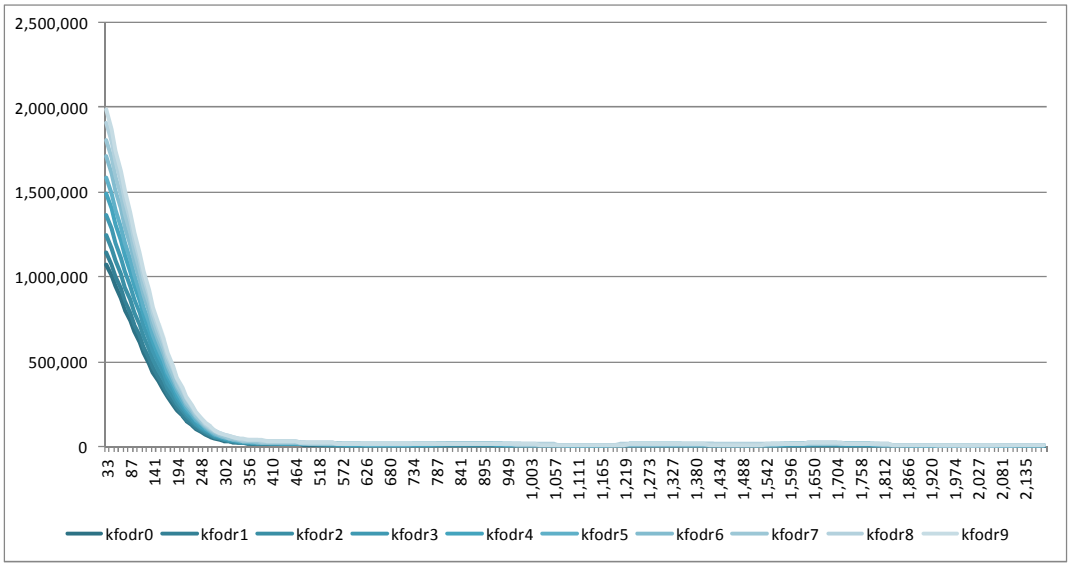
value of the Accommodation services will depend on the type of establishment chosen for overnight stays, and the price differences by regions for each one of them.

**Figure 2.4. Kernel regressions: Monetary flows versus distance *by year:* 2000-2009**
**$T_{ijt}$ = A: Total flows; B: Restaurants; C: Accommodation**

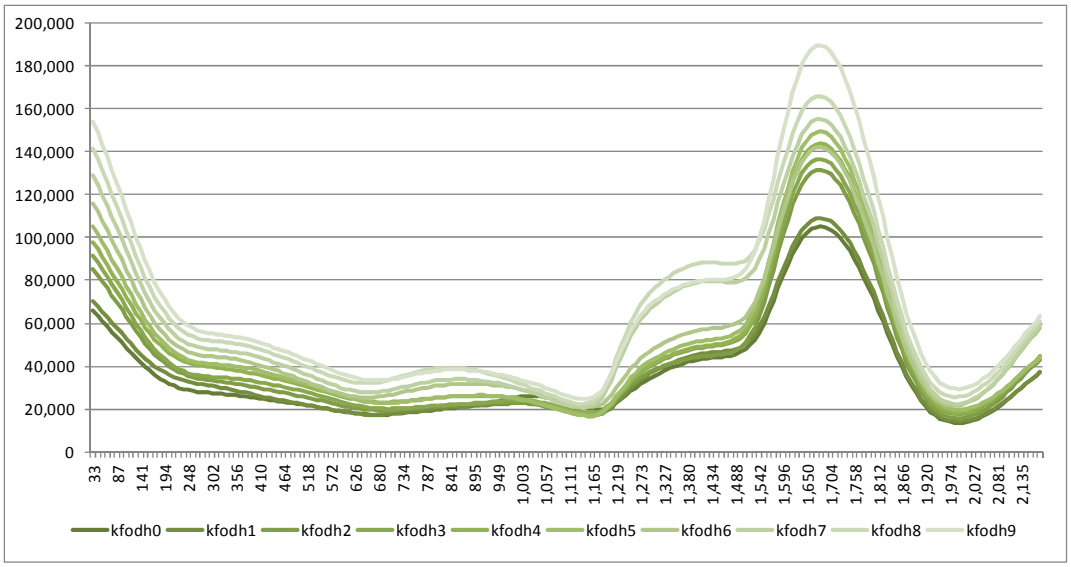
A




B




C



To this regard, although this analysis is beyond the scope of this article, it could be the case that the mix of overnights in longer trips could be associated with more expensive accommodation options (hotels and apartments). As an example, one may expect to find a more expensive mix of Accommodation services offered in the Islas Canarias or the Islas Baleares, as well as an above the average propensity to travel to these expensive accommodations/destinations from the richest (and sometimes distant) cities such as Madrid, Barcelona or Bilbao, both with a touristic or professional purpose. Of course, previous analyses have also shown that reality is much complex than this simple example, since long trips could also be associated with social networks derived from previous interregional migration flows or the ownership of second homes in the destination region (De la Mata and Llano, 2010, 2012).

In order to explore the restaurant-accommodation mix issue, and its effect on the "humped" shape of the distribution reported in **Figure 2.4-Panel A and C-**, we now consider a second set of kernel regressions, which are shown in three panels in **Figure 2.5**. In this case, the time dimension is substituted by the type establishment (*e*) used in the overnight. Therefore, each kernel regression is computed using the whole time period (2000-2009) and all the corresponding bilateral flows by each of establishment. In **Panel A** we report the kernel distribution of the monetary flows (kv_total) associated to the three sectors (Accommodation, Restaurants and Travel Agencies)[12]. It can be seen that the shape of the three series when considering the whole time period is more similar than the ones observed for each year and the same three types of flows (**Panel A, B** and **C** in **Figure 2.4**). In **Panel B** and **C** in **Figure 2.5** all the kernel distributions reported just consider the trade flows of Restaurants and Accommodation services linked to trips, overnights and excursions, and exclude Travel Agencies and daily expenses in Restaurants. In these two panels, the pure intraregional trade flows linked to daily expenses in Restaurants and Travel Agencies are not included in the corresponding series. By doing so we avoid mixing expenses which are rather different in nature (expenses in origin versus expenses in destination; and daily expenses in Restaurants versus the ones derived from trips). Thus, the difference between **Panel B** and **C** in **Figure 2.5** is the unit in which the flows are measured; that is, monetary units for **Panel B** and number of trips for **Panel C**. It is also important to note that the distributions shown in Panel B come from the "bottom-up" estimation and they are not adjusted to the regional output of each sector (given that we cannot assign a part of the production to the overnights or trips in a certain type of

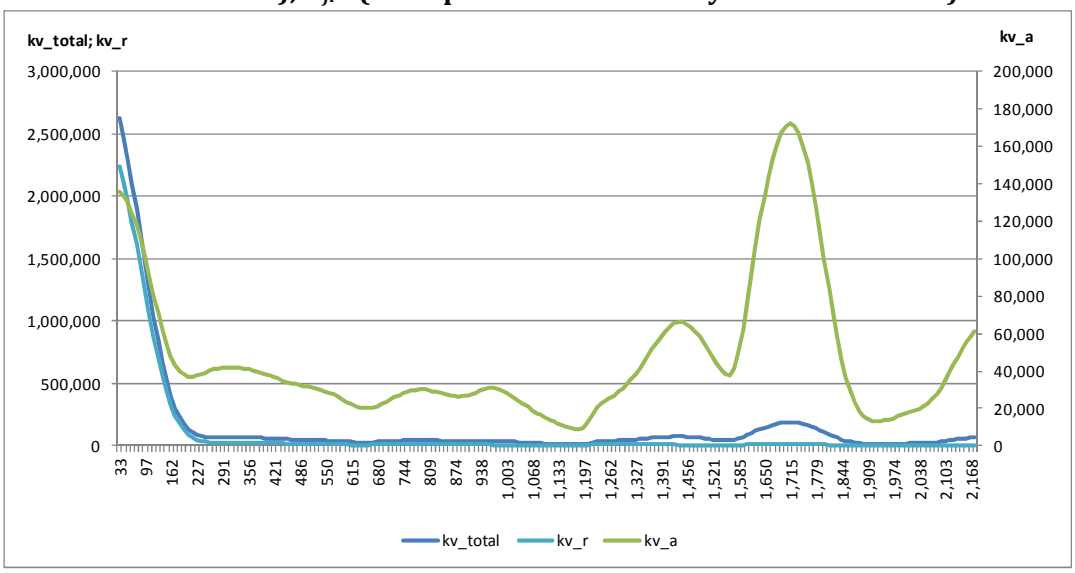
[12] Once again, in the appendix, we show separately the kernel for the total flows with and without the share of the sector of Restaurants that is not directly linked to trips, and also without travel agencies. The Restaurant sector (with and without this daily consumption) and the Accommodation sector are also plotted separately.

establishment). Focussing on **Panel B** we observe that the shape of the distribution for the monetary flows by type of establishment shows a clear agglomeration of trade in the shortest distance, although some of them also exhibit "humps" for large distances. In line with the hypothesis that when people go on vacation go to further locations, the two main "humps" are observed for the monetary flows associated with hotels and apartments, for distances between (1,100-1,800 Km). Then, **Panel C** plots the kernel distribution of the corresponding bilateral flows measured as "number of trips" (raw data from Occupancy surveys and Familitur). Now, the shape of the distributions, although bulged, shows a clear pattern of agglomeration in the shorter distances for some types of trips (second homes and excursions), but a flatter distribution in the longer distances for the most expensive categories (hotels and apartments).

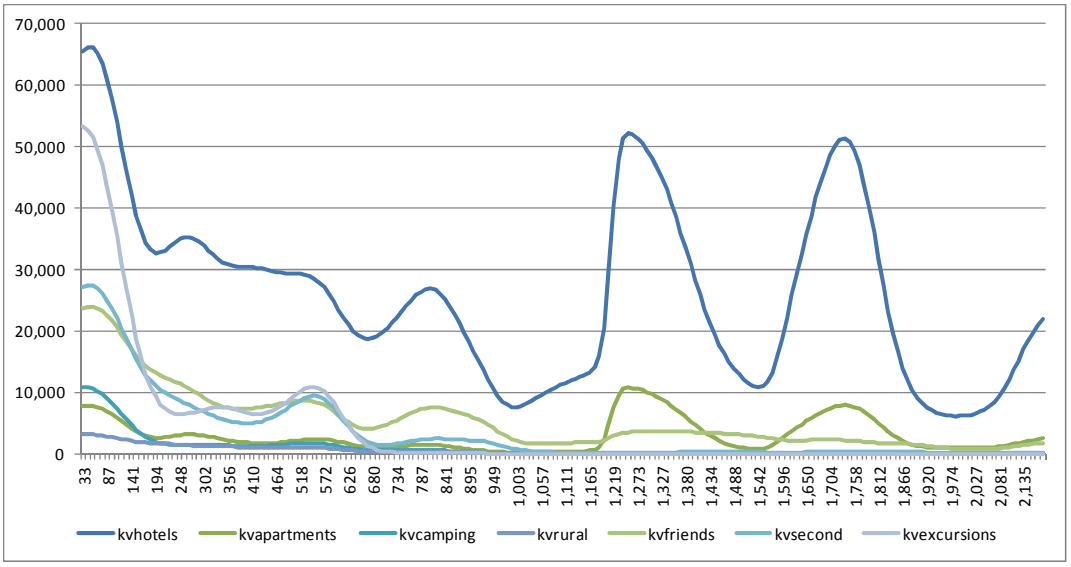
However, it is important to remark that this appearance is affected by the scale of the flows. For the sake of clearness, **Figure 2.6** offers a disaggregated view of the distribution of the monetary flows as well as the number of trips for the main types of establishments. Like in **Figure 2.5**, the monetary values plotted in **Figure 2.6** include the expenses in the Restaurant plus Accommodation sectors derived from domestic trips. Now, it is interesting to remark that, once each type of flow is considered separately, with each panel including two different scales for the monetary and the physical unit flows, the shape of each pair is quite similar for each type of flow. This result suggests that our treatment of prices for each type of flow is judicious, since it includes some variability depending on the destination region of the trip for each type of establishment, but do not dramatically change the bilateral relations observed in the trips themselves. Far from considering this prudent pricing strategy as innocuous, it is important to consider that through the combination of all types of trips in monetary units, we are obtaining a set of aggregate trade flows for each year (the ones plotted in **Figure 2.4 and Figure 2.5-Panel A**), which capture the "establishment mix" of each region.

**Figure 2.5. Kernel regressions. Monetary flows versus distance. Pooled 2000-2009**
**$T_{ij}$ = (A: Monetary flows: Total; Restaurants; Accommodation; B: Monetary Flows by accommodation); $N_{ji}$ =(C: Trips and excursions by accommodation)**

A




B




C

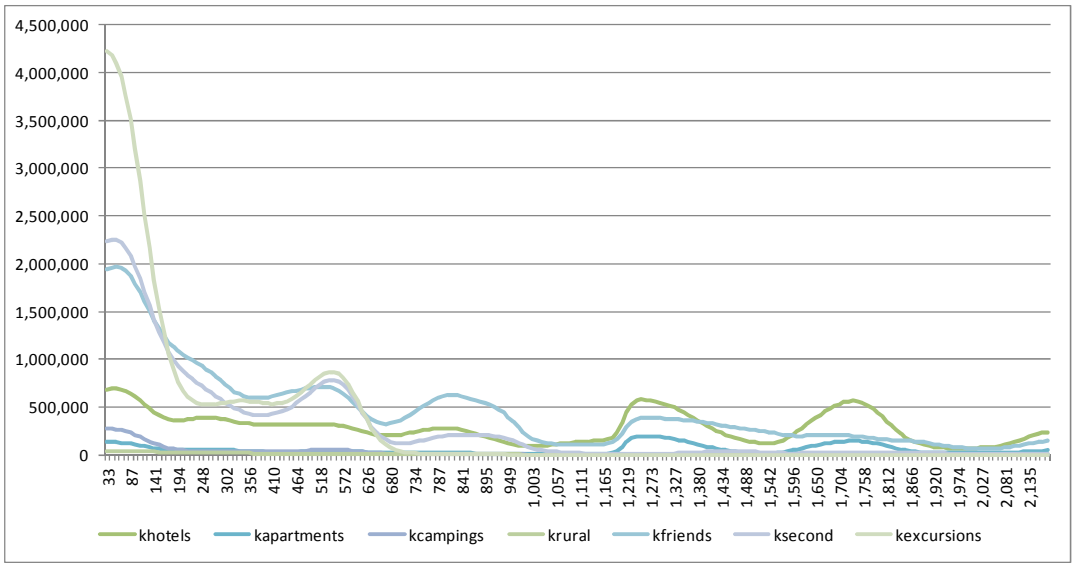
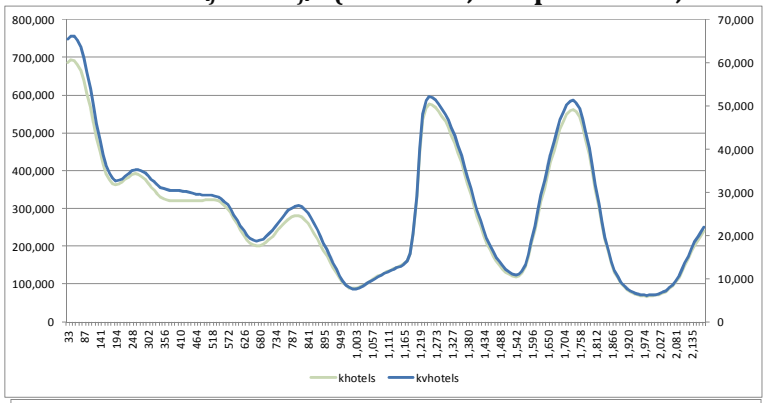
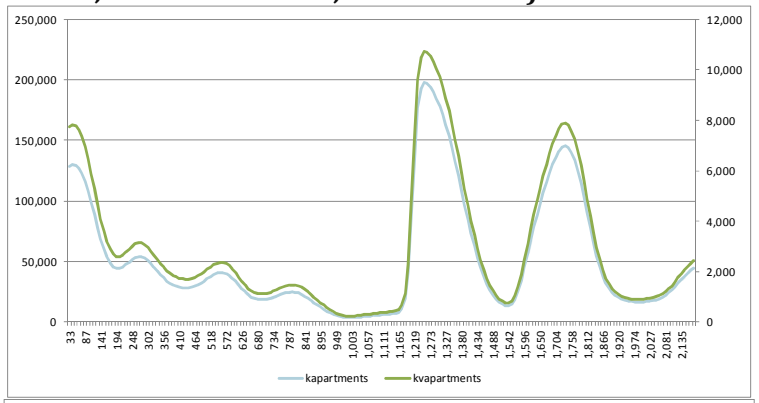


**Figure 2.6. Kernel regressions. Flows versus distance (Monetary flows *vs* Trips). Pooled 2000-2009. $T_{ij}$ *and* $N_{ji}$ *=(*A: Hotels; B: Apartments; C: Campings; D: Rural; E: Second homes; F: Excursions)**

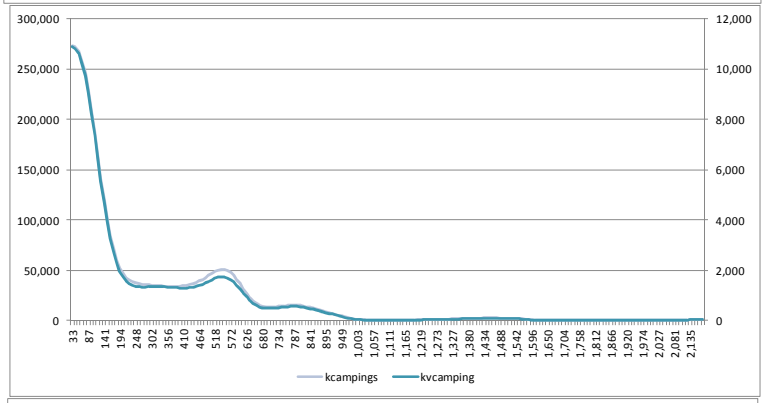
A



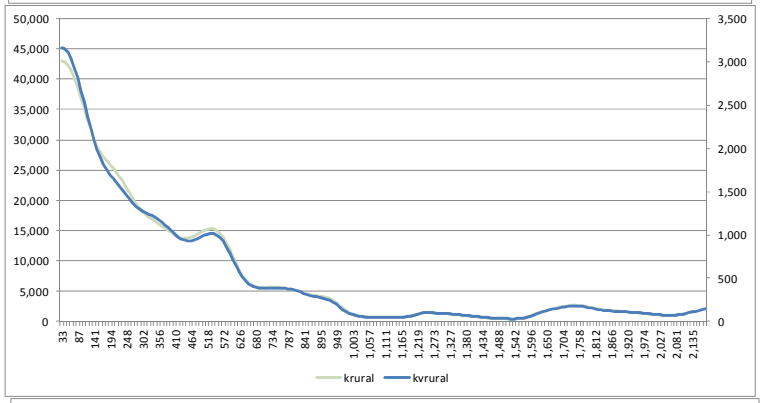

B



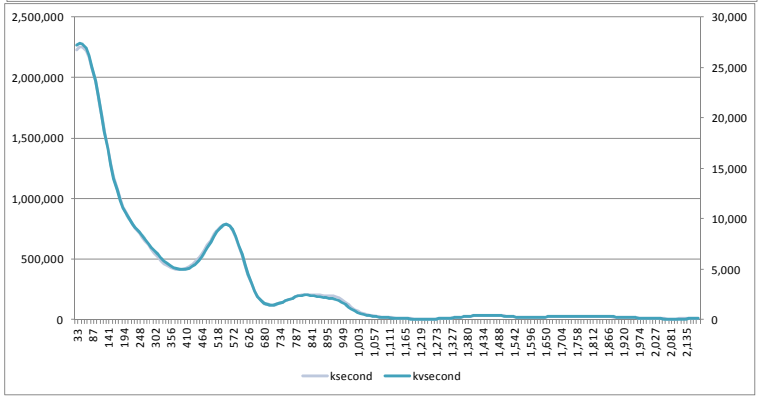

C



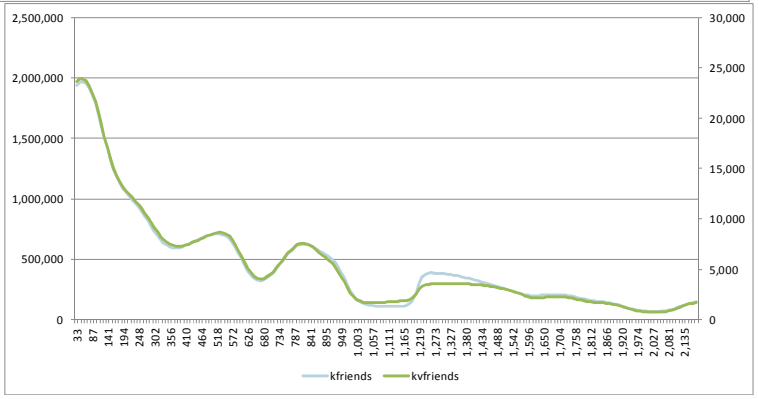

D




E




F



## 2.4. The gravity model and the interregional flows services

After describing the main features of this novel database on the domestic trade flows of Accommodation, Restaurants and Travel Agencies for the period 2000-2009, we estimate the gravity model over the aggregated and each specific flow. As it was said before, the gravity model has been widely used in the empirical literature of trade. In our particular case, it is defined by the following equation:

$$\ln T_{ijt} = \beta_0 + \beta_1 \ln gdp_{it} + \beta_2 \ln gdp_{jt} + \beta_3 \ln dist_{ij} + \beta_4 intra_{ij} + \beta_5 contig_{ij} + \delta_i + \delta_j + \lambda_t + u_{ijt} \quad (11)$$

In eq. (11) we use a general element $T_{ijt}$ to denote the endogenous variable to be modelled. Such general element could correspond to alternative variables depending on the specifications. For Ordinary Least squares (OLS) estimates, it will contain the intra and interregional bilateral flows in logarithms between every pair of regions *ij* for each year *t* for the period 2000-2009. In the basic specification of the gravity model described in eq.(11), three regressors are considered, namely, the *gdp* of the exporting and importing region as well as the bilateral *distance*, both in logarithm form. Finally, the general specification described in eq. (11) considers three types of fixed effects: a temporal dummy variable $\lambda_t$ to capture the characteristics of each year and the temporal evolution; and two origin and destination fixed effects, $\delta_i$ and $\delta_j$, which capture specific time-invariant characteristics of the regions and the multilateral resistance terms.

In addition, following the literature on "border effect" (McCallum, 1995; Okubo, 2004; Gil-Pareja et al., 2005; Requena and Llano, 2010; Llano et al., 2011), we include a dummy *Intra* that takes the value 1 when the exporting and importing region is the same (intraregional flows) and 0 otherwise. Moreover, a binary variable *contig* is included, which takes the value 1 when two regions are adjacent and 0 otherwise. Through this variable we want to control for the possible effect of sharing a border, something that can be of much interest when considering short trips on weekends, as well as excursions that do not include overnight stays. Thus, using these variables, we quantify the "border effect" at the regional level ( = exp [coefficient *intra*]), defined as how many times a region trades more with itself than with any other once size, border sharing, and distance are controlled for.

With regard to the interpretation and expected signs of the variables included, the gravity model assumes that the intensity of bilateral trade flow of services between two particular spatial units (countries or regions), will be positively correlated with the emission and absorption capacity of the exporting and importing regions (*i, j*), which in our case will be captured by the GDPs. By contrast, the intensity of the flow will be inversely correlated with the cost of the interaction between the two regions. Transport costs act as an impediment to trade. Therefore, the higher the transport costs are, the lower the likelihood of finding a trade flow, or the lower the monetary value of such flow. In the absence of information concerning the transportation cost for each mode used in a trip, and according to the normal procedure in the literature, the distance is used as a proxy. More specifically, the distance variable used here is taken from the 2001 Movilia survey, which collects an average of the actual distance in miles traveled by the Spanish residents in their internal displacements, regardless of the motive of the trip.[4]

Additionally, other factors can reinforce the economic relation between two economies such as sharing a boundary or the existence of good infrastructures that make the communications between them easier. On the contrary, some other characteristics can reduce the level of interaction, as the existence of trade barriers (legal, fiscal or cultural restrictions), a bad accessibility situation or a geographic isolation, derived from a bad transport infrastructure or some other factors that make the transport costs higher. For the specific case of trade of services, other authors (Kimura and Lee, 2006, Ceglowsky, 2006) have considered additional variables related to the remoteness or the cultural proximity between the trading countries. Conversely to this approach, which was previously considered in other papers (De la Mata and Llano, 2009, 2010), we focus here on: a) the standard gravity equation; b) the effect of the two dummies reported before -intra and contiguity-; c) and the sensibility of the results with regard to the flows in physical and monetary units and by the type of trip. We also discuss to some detail the robustness of the results in relation to different methods of estimating the gravity equation. For clearness, **Table 2.2** summarizes the variables considered and the expected signs.

[4] This measurement is particularly relevant for us, since by using the distances actually traveled by the tourists, we avoid the biases introduced by other measures based on the distance between provincial capitals or between the largest cities within each region. Note that this way of proceeding, common in the case of trade in goods, may not be best option for the case of a large share of internal trips, where the points of arrival are located in areas (coast or mountains), which do not have to coincide with the capital cities. In the absence of information on transport costs, and travel times for each transport mode, our distance measure could be considered as the best option at hand.

**Table 2.2. Variables used in the models.**

| Variable | Description | Source | Expected sign |
|---|---|---|---|
| $T_{ijt}$ | Monetary trade flow of services between regions i and j in time t | Own elaboration | - |
| $gdp_j$ | GDP in the importing region *j* in time *t* | INE (Regional Accounts) | Positive |
| $gdp_i$ | GDP in the exporting region *i* in time *t* | INE (Regional Accounts) | Positive |
| $dist_{ij}$ | Distance between region *i and j* | Movilia 2001 | Negative |
| $intra_{ii}$ | Dummy (=1 if i = j; 0 otherwise) | | Positive |
| $contig_{ij}$ | Dummy (=1 if i and j are contiguous; 0 otherwise) | | Positive |

## 2.5. Econometric analysis

Our analysis departs from 9 basic specifications reported in **Table 2.3**, all of which have been obtained by means of OLS estimation using the aggregate monetary trade flows. For most of them (models 1, 2, 3, 6, 7, 8 and 9), the independent variable corresponds to the aggregated *"Restaurants + Accommodations + Travel Agencies"* sectors for the whole period (2000-2009); that is, the same variable whose kernel distributions are portrayed in **Figure 2.4-Panel A**. As a robust check, **model 4** does not include expenses in Restaurants not linked to trips (the pure intraregional flows associated with daily expenses in the sector is not considered), while **model 5** also excludes trade linked to Travel Agencies which is always considered as intraregional.

**Model 1** is estimated without considering any kind of fixed effects, neither the dummy variables for the *"intra"* and *"contiguity"* effects. Therefore, the results obtained are in line with the ones obtained in classic gravity models for trade of goods and services before later contributions such as the ones by McCallum (1995) or Anderson and Van Wincoop (2003). The signs and elasticities obtained are in line with the expected ones, obtaining a negative elasticity for distance below 1, that is, slightly beneath the normal result for international and interregional estimates for goods.

Then, **model 2** includes the dummy variables for the *"intra"* and *"contiguity"* flows, as well as origin, destination and time fixed effects ($\delta_i, \delta_j, \lambda_t$), in line with Anderson and van Wincoop (2003), and all the subsequent literature. As we can see, when these new variables are included, the negative and significant coefficient for the distance drops intensely to -0.259, showing that, when the intraregional and contiguous regions flows are

controlled for, the relevance of distance as a geographical friction to trade for these services is much lower than in goods. In this regard, the positive coefficient obtained for the "intra" dummy is rather large (4.605), indicating that, on average, a Spanish region tends to trade these services 100 times more (99.98= exp(4.605)) with itself than with any other region in the country. In addition, the positive and significant coefficient found for the *"contiguity"* dummy (0,800) also confirms the great relevance of the expenses derived from short distance trips to the contiguous regions. These results are in line with the kernel distributions reported in **Figure 2.4** for the aggregate flows, as well as the main trade flows plotted in the map (**Figure 2.3**).

The next model tries to add a robust check to the previous result: in **model 3** we add time-origin fix effects as well as the time-destination fixed effect to the previous set of fixed effects in order to avoid that unobservable time variant factors specific for each region are not controlled for- as suggested in Baltagi et al. (2003). Therefore, the *"ln $gdp_i$"* and *"ln $gdp_j$"* variables are not included since the variation in both variables over time is captured by the new fixed effects. As reported, the coefficients for the dyadic variables obtained with this new model are the same than the ones from **model 2**. In addition, **model 4** uses the same specification, but removes from the independent variable, the part of the intraregional expenses in Restaurants that do not corresponds to trips. In this case, although the negative elasticity for the *"distance"* and the positive for the *"contiguity"* remain the same, the positive and significant coefficient for "intra" drops to 2.908. This result indicates that, when daily expenses in Restaurants are excluded, a Spanish region tends to trade these three services 18,32 times (=exp [2,908]) more with itself than with any other region in the country. Moreover, when considering the results from **model 5**, where also the pure intra-regional trade flows of travel agencies is excluded from the endogenous variable, the "internal border effect" drops to 11,870 (=exp [2,474]). Note that these results still indicate a strong "home bias"[13] effect on the three service sectors considered, even when just the flows in Accommodation and Restaurants generated by trips are included. Furthermore, the "internal border-effect" obtained for **models 4** and **5**

[13] Note that as Whalley and Xin (2009) pointed out, the border effect refers to a higher proclivity to trade behind rather than across national borders, and it is usually defined by the coefficient of a regional dummy. It can be present both in the data and counterfactual models. However, the home bias is defined as an Armington type of preference for domestic versus foreign products in trade models where goods are different across countries. It is reflected in the model structure and in the parameters. Despite this differences, very often in the literature both concepts are used, without taking into consideration the type of preference or the parameters of the model, to identify the fact that once size, distance and other factors are controlled for, trade within a country or a region tends to be higher than with any other country or region. We are just measuring the border effect without discussing if this is due to a different type of preferences or to any formal or informal barrier to trade.

is not far from the one obtained in some similar analysis based in the Spanish interregional trade of goods (Requena and Llano, 2010)

As a further robust check, we also compute 4 additional models which, maintaining the same specification than the previous three, consider 4 alternative sub-samples of the whole dataset.

- Model 6: includes just the exports of the "no coastal regions" to all the regions.
- Model 7: includes the exports of all regions to the "no coastal regions".
- Model 8: considers just the exports of the "coastal regions" to all regions.
- Model 9: includes the exports of all regions to the "coastal regions".

Regarding **model 6**, when the analysis is restricted to the exports of the no coastal regions, the coefficient for the distance variable decreases in absolute terms to -0.181 (significant at 10%), and the border effect grows up to a factor of 177 (=exp[5.176]). The results for **model 7**, where the imports of coastal regions are excluded, also points to an increase in the border effect (135=exp[4.909]), but in this case, to a higher elasticity of trade in respect to distance in absolute terms (-0.32). Conversely, the results obtained in **model 8**, for the exports from coastal regions, the elasticity of distance is (-0.383) and the border effect decreases to a factor of 62 (= exp[4.135]). Similarly, considering **model 9**, where just the imports of the coastal regions are considered, the elasticity of distance becomes -0.245 while the border effect reaches a factor of 88.85 (=exp[4.487]), which is lower than the one obtained in **model 3** (100 with the same specification but the whole dataset) but higher than the ones in **model 7** and **8**.

Considering these last four models together, it seems clear that being a landlocked region in Spain reduces the capacity of exporting and importing these three services to/from the rest of the country relative to its internal trade (higher border effect), but that the effect of sharing a border is higher for the exports of no coastal regions (0.947) versus coastal regions (0.704). This is linked with the fact that the demand of services produced in coastal regions seems to have a higher elasticity in respect to distance. This could be related with a better connectivity of landlocked regions. However, further analysis on the non-linear effect of distance and how the coefficients vary for each region according to their particular characteristics should be done in order to disentangle what factors are

behind these results. In section 4.3 a simple region by region analysis is carried out to shed more light on these results.

**Table 2.3. Main results for the aggregate flows (Restaurants + Accommodation + Travel Agencies). Monetary units (€). OLS. 2000-2009.**

| Model | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Variables | | | | | | | | | |
| *Ln dist* | -0.935*** | -0.259*** | -0.259*** | -0.292*** | -0.285*** | -0.181* | -0.320*** | -0.383*** | -0.245*** |
| | (0.124) | (0.0580) | (0.0611) | (0.0589) | (0.0601) | (0.0921) | (0.0869) | (0.0724) | (0.0722) |
| *Intra* | | 4.605*** | 4.605*** | 2.908*** | 2.474*** | 5.176*** | 4.909*** | 4.135*** | 4.487*** |
| | | (0.245) | (0.258) | (0.226) | (0.271) | (0.405) | (0.391) | (0.258) | (0.263) |
| *Contig* | | 0.800*** | 0.800*** | 0.800*** | 0.789*** | 0.947*** | 0.799*** | 0.704*** | 0.895*** |
| | | (0.0776) | (0.0818) | (0.0831) | (0.0838) | (0.119) | (0.109) | (0.113) | (0.117) |
| *Ln gdp$_i$* | 0.839*** | 1.044* | | | | | | | |
| | (0.0546) | (0.535) | | | | | | | |
| *Ln gdp$_j$* | 0.956*** | 0.368 | | | | | | | |
| | (0.0667) | (0.490) | | | | | | | |
| Constant | -15.35*** | -12.78 | 12.84*** | 13.11*** | 13.09*** | 11.50*** | 14.37*** | 13.68*** | 12.74*** |
| | (1.996) | (13.14) | (0.439) | (0.416) | (0.425) | (0.594) | (0.590) | (0.510) | (0.512) |
| Observ. | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 1,190 | 1,190 | 1,700 | 1,700 |
| R-squared | 0.587 | 0.945 | 0.948 | 0.938 | 0.926 | 0.951 | 0.944 | 0.954 | 0.962 |
| Dep. var | Flows (€) All | Flows (€) All | Flows (€) All | Flows (€) WR† | Flows (€) WR†† | Flows (€) NCE† | Flows (€) NCI† | Flows (€) CE† | Flows (€) CI† |
| Origin FE | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Orig-time FE | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dest. FE | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dest-time FE | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Estim. Proc. | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

WR†: Without expenses in Restaurants not linked to trips; WR††: Without expenses in Travel Agencies and in Restaurants not linked to trips.

NCE†: just "no coastal exporters"; NCI†: just "no coastal importers"; CE†: just "coastal exporters"; CI†: just "coastal importers".

Finally, it is interesting to look for some external references to the results obtained. In fact, the main interest of using pooled data with OLS and alternative sets of fixed effects is to produce results which can be compared –to some extent- with others obtained using interregional and international trade flows for goods and services. The literature on the "border effect" for domestic flows has estimated values that vary in a rank from 2 to 20 times for the case of goods (Helliwell, 1996, Wolf, 2000, Combes et al., 2005). To the best of our knowledge, there are no previous attempts to measure the "internal border effect" at the regional level using domestic flows for the service sector. The values obtained in this analysis for the three service sectors rank from around 12 to 176. These values are clearly larger than the average levels achieved by other papers when analyzing the interregional and international trade of goods. However, as we have seen, the magnitude of the border effect obtained when we remove the part of the intraregional that corresponds to the consumption in Restaurants not linked to trips as well as the pure-

intraregional consumption in Travel Agencies is not far from the border effect obtained in goods (18,32 in **model 4** and 11.87 in **model 5**). The large coefficient for the dummy variable measuring the propensity to trade within a region cannot be interpreted as an indicator of an exogenous restriction to interregional trade, but rather as an evidence of, mainly, the importance of daily expenditure on Restaurants of the residents in their own regions (as seen in the reduction of this coefficient once we drop these kind of flows from the analysis in models 4 and 5), as well as a strong propensity to consume Restaurants and Accommodation services in the neighboring regions. To this regard, our results also verify the positive effect of sharing regional boundaries on the intensity of the interregional flows of the services considered.

Regarding the elasticity of trade of service with respect to distance, we find two interesting benchmarks for our results. On the one hand, Ceglowsky (2006) obtained an average elasticity of total trade flows (X + M) to distance of about -0.90 for services and −1.09 for goods. However, other studies using the gravity model for international tourist trips (excluding intra-national flows and without considering monetary flows), found even lower elasticities with respect to distance (-0.2 for Khadaroo and Seetanah, 2008), more similar to the ones obtained when we control for intra-regional flows and adjacency. Although the difference in data and scope of these papers is clear, it is interesting to see how these coefficients are in line with the ones obtained, respectively, in our model 1 (Ceglowsky, 2006) and the other 8 specifications (with elasticities that rank between −0,181 and -0.383).

## 2.6. Robustness analysis using aggregate monetary flows and the PPML estimator.

Besides the previous specifications allowing comparisons with other estimates in the literature using OLS, we now aim at obtaining more refined estimates using a Pseudo Poisson Maximum Likelihood estimator (PPML) originally proposed by Santos-Silva and Tenreyro (2006), with the aim of controlling for heteroskedasticity and the zero observation problem. In relation to the latter, although the aggregated flows have no zero flows at all, the disaggregated ones by particular sector, which are analysed in the following sections, do.

With this purpose, **Table 2.4** reports the results obtained for the same 9 models using this new estimation procedure. Note that in this case, the endogenous variable is expressed in levels, while the regressors are in logarithms.

In a quick view, it is remarkable that the coefficients for all the variables are significant and have the expected sign. Like in the previous estimates based on OLS, the results obtained with PPML also indicates that the negative elasticity of our aggregate of services with respect to the distance decreases considerably when we control for the "*border effect"* and the *"contiguity"*. The results are also consistent with those obtained when we control for the time-origin and time-destination characteristics.

Focusing on the coefficient for the *"border effect"* obtained for each model when using PPML for our three service sectors, we also observe a drop in its positive value in **model 4** and **5** with respect to their counterparts in **models 1, 2** and **3**.

**Table 2.4. Main results for the aggregate flows (Restaurants + Accommodation + Travel Agencies). Monetary units (€). PPML. 2000-2009.**

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| *Ln dist* | -1.73*** | -0.208* | -0.208* | -0.287** | -0.271** | -0.0425 | -0.102 | -0.54*** | -0.37*** | -0.35*** |
| | (0.131) | (0.121) | (0.121) | (0.113) | (0.121) | (0.150) | (0.140) | (0.137) | (0.0921) | (0.0641) |
| *Intra* | | 4.092*** | 4.095*** | 2.331*** | 1.886*** | 4.433*** | 4.932*** | 3.570*** | 3.863*** | 1.763*** |
| | | (0.293) | (0.292) | (0.274) | (0.305) | (0.325) | (0.271) | (0.336) | (0.238) | (0.167) |
| *Contig* | | 0.394*** | 0.395*** | 0.488*** | 0.452*** | 0.647*** | 0.858*** | 0.396** | 0.458*** | 0.849*** |
| | | (0.149) | (0.149) | (0.146) | (0.155) | (0.146) | (0.160) | (0.190) | (0.142) | (0.0820) |
| *Ln gdp* | 0.574*** | 1.213* | | | | | | | | |
| | (0.121) | (0.711) | | | | | | | | |
| *Ln gdp* | 0.723*** | 1.206* | | | | | | | | |
| | (0.123) | (0.654) | | | | | | | | |
| *Constant* | -1.232 | -31.59** | 12.38*** | 13.34*** | 13.40*** | 11.14*** | 13.21*** | 14.42*** | 13.37*** | 16.55*** |
| | (3.397) | (13.05) | (0.836) | (0.787) | (0.847) | (1.063) | (0.865) | (0.944) | (0.650) | (0.451) |
| Observat. | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 1,190 | 1,190 | 1,700 | 1,700 | 2,890 |
| $R^2$ | 0.601 | 0.910 | 0.913 | 0.911 | 0.899 | 0.903 | 0.902 | 0.938 | 0.943 | 0.960 |
| Dep. var | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) |
| | All | All | All | WR† | WR†† | NCE† | NCI† | CE† | CI† | All-goods |
| Origin FE | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| O-time FE | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dest. FE | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| D-time FE | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Est Proced. | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

WR†: Without expenses in Restaurants not linked to trips; WR††: Without expenses in Travel Agencies and in Restaurants not linked to trips. NCE†: just "no coastal exporters"; NCI†: just "no coastal importers"; CE†: just "coastal exporters"; CI†: just "coastal importers".

Like in **Table 2.3**, four additional models are included to check the robustness of these results **(models 6 thru 9** in **Table 2.4)**, which uses the same 4 alternative sub-samples than before. The behavior of most of the variables fits with the expected one, with the exception of the distance when we consider the exports of no-coastal regions to all regions or imports of no-coastal regions from all regions, which appear to be non-significant, thereby indicating that distance is not an obstacle to trade these services for the landlocked regions. Regarding this result, it is interesting to remark that while the OLS model 7 registered a high negative elasticity for distance, with the PPML it becomes non-significant. Moreover, as with OLS, when we consider the exports of the no-coastal regions to all regions or imports of the no-coastal regions from all regions, (**models 6** and **7**), the border effect is above the one for the total flows in **model 3**. More specifically, the internal border effect in **model 6** and **7** reaches a factor of 84 (=exp[4.433]) and of 138 (=exp[4.932]) respectively, while in **model 3** was of 60 (=exp[4.095]).

While the number of references in the literature using PPML estimation procedures is very scarce, it is interesting to consider the results found in Garmendia et al. (2012), where a border effect of 2,411 (=exp[0.88]) was obtained using Spanish intra and inter-provincial flows (Nuts 3) of goods and a very similar specification. This result could be compared to the one obtained for the aggregate service sectors -in a context of Nuts 2 regions-, which reached the lowest factor of 6.59 (=exp[1.886]) in **model 5**.

For a more accurate comparison, we have replicated exactly the same specification used for our **model 3** of services, but using the interregional trade flows of goods between the Spanish regions (in this case also for Nuts 2) for the same period (2000-2009). This data comes from the c-intereg project (www.c-intereg.es). These results are reported as **model 10** (grey shadowed column) in **Table 2.4**. The elasticity of distance obtained for goods (–0.358) is larger than the one obtained for services in models 2 thru 5. In addition, the "border effect" obtained for goods is 5.83 (=exp[1.763]), which is close to the 6.59 obtained for **model 5**, considering just trade of services in Restaurants + Accommodation linked to trips, overnights and excursions; that is, without including Travel Agencies and intraregional daily expenses in Restaurants. It is also remarkable the larger coefficient found for *"contiguity"* (0.849) in the trade of goods, a value that doubles that corresponding to the same variable in services in all of our specifications. To this regard, although we have commented the large accumulation of trade of services in the contiguous regions, mainly due to frequent trips and excursions during weekends, we are now able to verify that this agglomeration is lower than that of goods. Summing up, although services

have been traditionally considered as non-tradable, it can be said that this cannot be generalized since there are service sectors that are truly non-tradable (as it is the travel agencies in our case), sectors that are partially non-tradable (if we understand that there is a large share of the output in the sector of Restaurants and the like that is consumed by the individuals in their regions of residence as a consequence of the normal life and that it is not linked to trips and that this would be an indication of their non-tradability, ), and other sectors (as Accommodation or Hostel industry) that are linked to trips, and thereby should be considered as tradable. In fact, once we individually consider the service flows according to their different nature, the elasticity with respect to distance in not very different (even lower) than the one obtained for goods (which could be in part explained by the lower coefficient of distance).

## 2.7. Regional analysis

Once the aggregate flows have been analyzed by means of alternative specification of the gravity model, we proceed to investigate the performance of the same models for each Spanish region. In De la Mata (2010) an analysis based on micro-data revealed differences in parameters that influence the decisions of the residents in each Spanish region with regard to their destination choice. These discrepancies may be the result of the geographical or cultural characteristics of each region. That finding was related to the results obtained by Johnson and Ashworth (1990), who concluded that different places may attract tourists with diverging economic characteristics. It is possible that on average, a region could be more attractive for residents of one particular region than for the others. This idiosyncratic demand –to term it that way- could be explained by common historical and cultural ties (Llano and de la Mata, 2012), taste preferences, the presence of social and business networks (De la Mata, 2012), or the existence of any kind of geographical or competitive advantage (proximity, better connectivity through infrastructures, complementarity in weather and leisure supply, etc.). If each region attracts relatively more residents from specific locations, and the characteristics of the demand depend on the location of the incoming travelers, each region may be facing demands with different elasticities. If such heterogeneity exists, the predictions produced by a general model, which does not consider these specificities of each region, will be biased, and therefore they may be unreliable when taking political or business decisions. Moreover, for each exporting region, the higher the income elasticity of demand of the importing regions, the

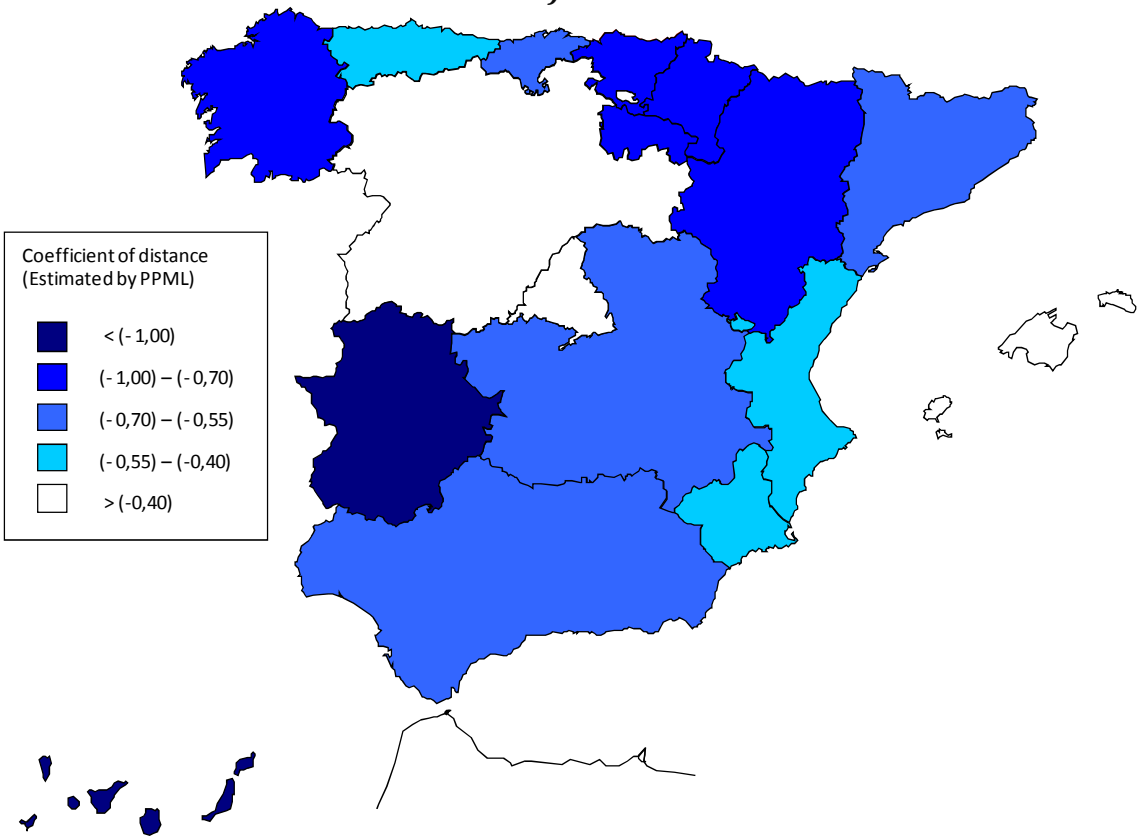
larger the reduction of sectors linked to tourism when the regional income of the importing regions drops–as a result, for example, of an economic crisis. Then, it will be necessary to offset this decline with improvements in other factors that may attract visitors. In the case of distance, due to the singular features of each region regarding the level of remoteness or its endowment of transport infrastructure, some regions could be more sensitive to distance as an impediment to trade. Thus, regions with higher elasticities with respect to distance are those that obtain larger profits from a new infrastructure–or the improvement of the existing ones, which in the end reduces the actual distance that needs to be travelled in order to get there.

For brevity, the results corresponding to the regressions using PPML and region specific exports to the rest of the regions are reported in **Table 2.6** in the **Appendix**. Here, the results for the "distance" and "intra" variables are plotted in **Figure 2.7**, **Panels A** and **B,** respectively. Although our analysis focuses on these results, OLS estimates are also reported in **Table 2.7** in the Appendix for robustness. We start analyzing the aggregate trade flows of services exported by each Spanish region using PPML, and how the coefficient of 'distance' varies across regions (**Figure 2.7**-**Panel A**). As it can be seen in **Table 2.6** in the Appendix, the coefficients are negative and significant for all the regions. Then, as it can be observed in **Figure 2.7-Panel A**, the value of the coefficient goes from –0.118 in Extremadura to –1.618 in the Islas Canarias. As summarized in the color code of the map in **Panel A**, higher negative elasticities are obtained for two regions with completely different features: Extremadura and Islas Canarias. The common factor of differentiation (given that we are analyzing domestic trade of services) in both cases is 'remoteness'. However, one may want to consider that this 'remoteness' is relative to other factors[14]. With this regard, the remoteness of the two regions should be analyzed cautiously, considering for example, the touristic supply offered in each one of them, or the preferred transport mode used to reach that region when traveling from most populated and rich regions. In this regard, and since the relation between transport cost and distance is not linear for each transport mode, it would be interesting to replicate this analysis using travel times and transport costs; that is, considering the "transport mode mix" used to travel to each of the service exporting region. Unfortunately, such information is not available for the Spanish case with the detail required in our case.

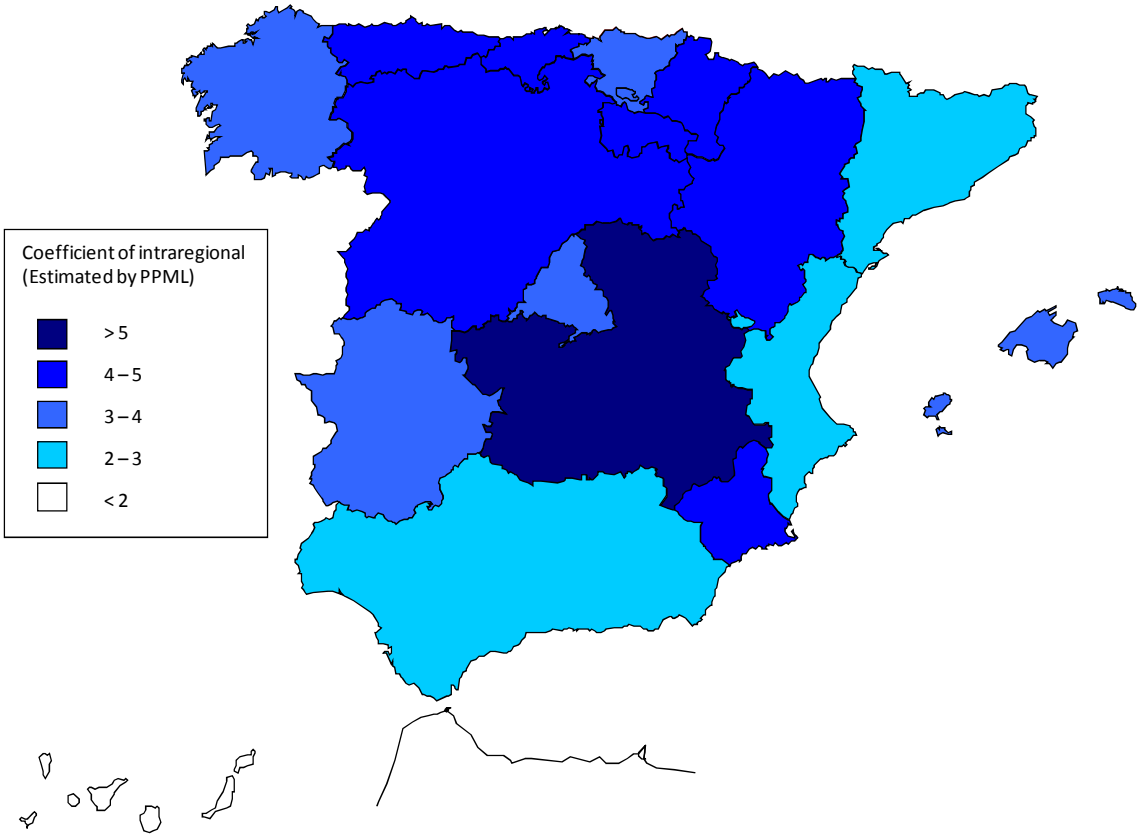
[14] Some of these factors are included explicitly in the model (GDP, intra, contiguity), while others are just controlled through the fixed effects. From a complementary perspective, some of these additional variables not included in our specifications have been considered in previous studies (De La Mata and Llano, 2012).

**Figure 2.7. Coefficients for the Spanish regions. Monetary flows. 2000-09. *PPML.***

***Panel A) Distance***




***Panel B) "Intra" (Internal Border effect)***



It is also important to highlight that a possible cause explaining the high elasticity of the exports from the coastal regions with respect to distance (shown in model 8 in **Table 2.3** and **Table 2.4**) could be the high elasticity of the demand of the services produced by Canarias and Galicia (both coastal), and the importance of the interregional exports of the former. A more detailed analysis on the composition of the service demand of each region will be done in future works.

It is surprising the heterogeneous results regarding the coefficient of distance in the two island regions. While Islas Baleares are able to compensate its lower accessibility, and obtain one of the lowest coefficients for distance, the Islas Canarias register a large negative elasticity for distance. It is also necessary to note that in the specific case of the three service sectors considered here, physical proximity between the place of origin or destination of the trip is not always a driving factor of the flow, given the interest of many tourists to "flee from the usual environment "and visit more diverse places, in terms of weather, culture or lifestyles. In this sense, for certain regions and types of trips, distant destinations could be a preferred option. Taking this into account, we expect that those regions with a capacity to attract tourists from farther destinations above the average will exhibit lower negative elasticities of their service exports with respect to distance. In our view, this can be the case of Islas Baleares. Moreover, the low negative elasticities of the service exports in Madrid (-0.075) or Castilla y León (-0.118) can be explained by its centrality, the radial transport infrastructure of the country, or the additional attractiveness of Madrid being the capital city, as well as being the destination of trips with a business, administrative or cultural motive.

Regarding the results obtained for the internal border effect (*intra*) in each region, it is interesting to remark that the coefficient for this variable is positive and significant for all the regions, except for the Canary Islands, where it is not different from zero statistically. The significant coefficients for *intra* obtained rank between 16 (=exp[2.810]) in Comunidad Valenciana, and 163 (=exp[5.091]) in Castilla-La Mancha.

## 2.8. Analysis by type of establishment

Next, we analyze the establishment specific flows using the specification of **model 3** using PPML. **Table 2.5** shows the results for the monetary flows[15] generated by the Restaurant +

[15] In the appendix, the results using the number of nights or trips as the dependent variable are reported. The analysis has been done with PPML and OLS for robustness.

Accommodation service as a consequence of trips, overnights and excursions for each specific type of establishment. Note that for types 1 thru 4, the overnights imply an expense (flow) in both the '*Accommodation*' and '*Restaurants and the like*' sectors, while for categories 5 thru 7 –day trips– just give rise to an expense in '*Restaurants and the like*'. In order to analyze potential differences between both groups of expenses, the results in **column 8** (pernct1) correspond to the aggregate of the service expenses in Restaurants + Accommodation generated by the categories that produce expenses in Accommodation (Hotels, apartments, campgrounds, rural tourism). Then, the results in **column 9** (pernct2) include as dependent variable the aggregate value of the expenses in Restaurants + Accommodation, obtained from the bottom-up process and without the final adjustment to National Accounts ($F_{ijt} = \sum_e Fa^e_{ijt} + Fr^e_{ijt}$ )—equations 6 and 7. Then, even when the dependent variable contains the flows generated by all kind of trips, the results differ from those obtained when the analysis is done for the aggregate flows coherent with the regional output figures.

**Table 2.5. Results for Restaurants + Accommodation monetary flows generated by trips, overnights and excursion for each category. 2000-09. PPML**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Var. | H | Ap | Camp | Rural | Friends | 2ndH | Exc | Pernct1 | Pernct2 |
| Ln dist | -0.292** | -0.636*** | -0.766** | -0.819*** | -0.608*** | -0.748** | -0.553 | -0.362*** | -0.434*** |
| | (0.120) | (0.198) | (0.321) | (0.210) | (0.169) | (0.309) | (0.352) | (0.124) | (0.154) |
| Intra | 0.859*** | 1.005* | 1.281* | 0.483 | 0.606 | 1.290* | 2.249** | 0.898*** | 1.190*** |
| | (0.332) | (0.526) | (0.671) | (0.416) | (0.451) | (0.729) | (0.964) | (0.339) | (0.423) |
| Contig | 0.0971 | -0.266 | -0.172 | 0.0773 | 0.203 | 0.183 | 0.325 | 0.0803 | 0.163 |
| | (0.147) | (0.321) | (0.400) | (0.194) | (0.201) | (0.307) | (0.603) | (0.161) | (0.214) |
| Constant | 13.38*** | 12.16*** | 12.55*** | 11.06*** | 14.04*** | 14.14*** | 12.72*** | 13.82*** | 14.65*** |
| | (0.839) | (1.396) | (2.131) | (1.463) | (1.163) | (2.113) | (2.446) | (0.870) | (1.082) |
| Observ.. | 2,890 | 2,720 | 2,720 | 2,720 | 2,890 | 2,805 | 2,890 | 2,890 | 2,890 |
| $R^2$ | 0.874 | 0.921 | 0.952 | 0.774 | 0.709 | 0.650 | 0.650 | 0.878 | 0.797 |
| Dep. Var. | (€) | (€) | (€) | (€) | (€) | (€) | (€) | (€) | (€) |
| Origin FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Orig-time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dest. FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dest-time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Est.procedure | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Pernct1: Hotels, apartments, campgrounds, rural tourism.
Pernct2: Include all flows together obtained in the bottom-up process, without the final adjustment to match National Accounts.

Then, the results in **Table 2.5** are similar but not equal to those reported in **Table 2.4** for the aggregate flows. It seems convenient to start by analyzing the elasticities in column (9), since it includes the most similar endogenous variable than the one in model 5 in **Table 2.4**, where also all the Restaurants and Accommodation expenses derived from all type of trips were aggregated (but only the consumption derived from any trip), although in that case we were using part of the adjusted flows (Eq. 5 thru 7) instead of the "raw" values $F_{ijt} = \sum_{e} Fa^{e}_{ijt} + Fr^{e}_{ijt}$ (Eq. 6 and 7) from the bottom-up estimation. Note that while in **model 5** from **Table 2.4** all the coefficients were significant and had the expected sign, in **column 9** from **Table 2.5** the contiguity dummy is not significant. The elasticity of distance in the latter is of -0.434, while it is -0.271 in the former. Regarding the border effect the results for **column 9** in **Table 2.5** show a factor of 3.2 (=exp[1.19]), lower than the one obtained in **model 5** from **Table 2.4** (6.59=exp[1.886]). Therefore, it seems that when using the "raw" flows the accumulation of intra-regional trade (shortest distance) is lower than the one observed for the "adjusted" flows. By contrast, the intensity of trade with the contiguous regions is less pronounced, with non-significant differences with regards to the trade with any non-adjacent region. The results included in column (8) correspond to the flows associated with trips that produce Accommodation expenses in regulated types of establishments (Hotels, apartments, campgrounds, rural tourism). As we can see, the results do not vary too much with the previous specification that considers all categories together.

Finally, focusing on each specific type of flow it is interesting to highlight that, for all of them, the contiguity dummy is not significant. Moreover, the border effect (*intra*) is also non-significant for Rural Tourism (4) and Friends (5). However, for significant cases there are some values that are below those obtained for the aggregate flows, except for excursions: for example, while the "home bias" for the aggregate flows reaches a factor of 6.59 (=exp[1.886]) in **model 5** from **Table 2.4,** the ones obtained for the establishment specific flows rank between the maximum in "excursions" (9.48=exp[2.249]), and the minimum in "Rural Tourism" (1.6=exp[0.483]). Finally, it is worth noting the small negative elasticity registered by the trade flows linked to trips in Hotels (-0,292), which is in line with the "humped" shape of the kernel distribution observed in **Figure 2.5** and **Figure 2.6** for the flows of Accommodation, where overnights in hotels are of a great importance.

## 2.9. Final remarks

In this chapter we present a new methodology to estimate the interregional trade flows of three services sectors in Spain. This new database is coherent with the main official figures of production and international trade in Spain (*National Account, Annual Services Survey, the Balance of Payments, the Tourism Satellite Accounts, Familitur, the Occupancy Surveys, and the Household Budget Survey*), covering the largest period of time for which all the statistical information is available. In this way we go beyond the main limitations that until now exhibited the empirical works about the analysis of bilateral trade of services within a country, given the lack of information about monetary flows detailed by origin and destination in most countries. Although the paper focuses on the Spanish case, it is considered that the same methodology can be applied to other countries with similar statistical information.

Departing from this novel database, a descriptive analysis of the spatial distribution of the output of services has been performed, identifying the main geographical markets and time trends between 2000 and 2009. From the descriptive analysis of the patterns of the flows we identify strong intraregional flows with respect to the interregional values. These intraregional flows are mainly linked with the consumption in '*Restaurants and the like*' that is not linked to trips, but with the consumption linked to this sector as a consequence of normal everyday life. It is also remarkable the importance of the domestic flows of sectors linked with tourism activity when compared to international flows. When the distribution of the interregional bilateral flows are analyzed in detail, we got that a large share of the interregional exports take place from the coastal regions in the east and the islands towards rich and highly populated regions as Madrid or Cataluña. In addition, large flows are found between regions that have strong linkages in terms of the stocks of immigrants. This is the case of contiguous regions such as Castilla y León or Castilla – La Mancha with Madrid, or non-contiguous regions that are farther apart as in the case of Andalucía and Cataluña.

Later, we have analyzed the bilateral trade flows using a set of kernel regressions. This first analysis has been done taking into consideration the existence of some regional heterogeneity as well as considering aggregate and trip specific flows. We find evidence of the disproportion between the intra and the interregional flows, motivated by the large share of the Restaurants and its intraregional nature. But even when the intraregional flows not linked to trips are dropped from the analysis, a strong density of flows in short

distances is found for 'Restaurants'. For the Accommodation sector, although the same agglomeration for short distances is found, after a certain number of kilometers a second agglomeration is found. This is in line with the hypothesis that, for a certain type of trips or type of establishments farther regions might be chosen.

Then, through different specifications of the gravity equation, we confirm a larger elasticity for the domestic flows with respect to distance. However it has been verified that the higher coefficients corresponds to the intraregional flows, followed by the flows between contiguous regions, and that once we control for these types of flows, the elasticity of the distance reduces to lower levels, similar to the elasticities found in other articles that analyze the international movement of tourists (Khadaroo and Seetanah, 2008). An additional analysis for each region has been carried out, identifying some regions with higher elasticities with respect to distance and the border effect. Finally, the results from the bottom-up estimation by type of establishment have been obtained, thereby identifying that the elasticities vary depending on the type of establishment or trip.

In our view, the results obtained in this chapter are able to enrich the limited empirical experience on analyzing the trade of services, both between countries and within them. We have been able to shed some light on the heterogeneity of services, their tradability, the distance and the role of regional borders and geographical situations as impediments or enhancements of trade. Departing from these contributions, in future research we expect to analyze the causes and economic consequences of the different elasticities found here by regions and types of trips. In this regard, as future extensions of this paper, the next empirical papers (Chapter 3 and Chapter 4) the impact of the transport costs (proxied by distance) and the social and business networks as additional explanations for some special intense flows will be analyzed. Moreover, we expect to be able to analyze the current dataset and the interaction with the flows of Transport services exploiting a dataset that we have produced with a similar method regarding the interregional trade flows of nine transport services in Spain. A relevant extension of this study is to connect our novel dataset on domestic trade of these three services with their counterpart bilateral flows with the rest of Europe and the world.

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## 2.11. Data appendix

**National Account – Input Output Table (SIOT)** offer the more solvent figures on the actual production of the three productive activities included in our dataset, so the level of domestic production of these branches according to this data source is taken as the reference point for the majority of national and regional statistics on tourism and also for our estimate, so it will be the reference source for national output in the dataset used in this work. The national level of current production is given by the current production of the System of National Accounts and Input-Output Tables from the INE for the years 2000-2007. For 2008 and 2009, when it is not still available, the figures of current production are estimated from the growth of the GVA of the sector taken from the National Accounts and the relationship between production and GVA observed in the last year available.

**Spanish Annual Survey of Services (SASS)** collects information on turnover, output, geographical distribution of turnover, consumption of goods, trade margin in the regions

where the headquarters of local companies in the service sectors are located. Data are available annually in a relatively homogeneous series from 2000 to 2009 and a sufficient disaggregation is provided, which allows separate treatment for each sector. This database will be used in order to impute a regional disaggregation of the output data consumed by Spaniards.

**The Balance of Payments (BOP)** is the basic reference source on international trade for any service sector nationwide. The BOP, under the heading of "Travel", includes as exports (imports) all services provided by residents (non-residents) to non-residents (residents) during their trips. Since this is the reference figure for national exports, it is the basis for the calculation of international exports of services to Hotels, Restaurants and Travel Agencies.

**Tourism Satellite Account (TSA)** follows the methodological principles of the National Accounts and collects information from both the supply side (production structure, intermediate consumption and gross value added of touristic companies,...) and from the demand side (domestic tourism, international, type of goods and services, ...). The data is available at the national level from 2000 to 2007. The Tourism Satellite Account (INE) contains information about internal tourism consumption by products (accommodation, restaurants, passenger transport, cultural, recreational and sports ...) and components (inbound tourism consumption, households, intermediate and general government). This is a reference source for tourism activity and is used to obtain the percentage of the total international exports regarding the sectors that have been considered.

**Egatur** is a survey conducted by the Instituto de Estudios Turísticos (IET) reporting tourism expenditure of non-residents. In this survey we find information since 2004, on both the spending and the behavior of tourists in Spain. According to EGATUR, tourism expenditure is defined as the total expenditure made by visitors in each trip. This expenditure, therefore, includes both the costs incurred in the place of residence, and those made in the place of destination. EGATUR provides data on spending by foreign tourists according to the main destination region. This data source has been used in order to obtain the regional distribution of the exports in these sectors.

**The survey on the Tourist Movements of Spaniards (Familitur)** is conducted annually by the Instituto de Estudios Turísticos (IET) and it is one of the major statistical operations the ITS performs. This source is used by the Bank of Spain to compile the information on the Balance of Payments. This is a survey addressed to households in which individuals are asked for information about all overnight stays in different types of establishments: hotels, campsites (camping, caravans, cottages ...), rented apartments (by individuals and agencies), second-homes and homes of relatives and friends. Additionally, information on one-day-trips is collected.

The **Occupancy Surveys** (INE) collects on a monthly basis information in registered establishments. The main limitation of this source is that being a survey of touristic accommodation establishments, the unregulated accommodation, as illegal apartments and private homes, are not collected. The INE publishes four occupancy surveys: Hotels Occupancy Survey (hotels, apartments, motels, hostels, pensions...), Campsite Occupancy Survey (mobile homes, caravans, tents...), Apartments Occupancy Survey (apartments and operators of tourist apartments) and Rural Tourism Occupancy Survey. With these data they produce several **Price Indexes** for different types of accommodation.

# 2.12. Appendix

**Table 2.6. Results for each Spanish region. Aggregate flows (Restaurants + Accommodation + Travel Agencies). PPML estimates. Monetary units (€). 2000-2009**

| Model | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Var. | | | | | | | | | | | | | | | | | |
| Ln gdp_d | 1.273*** | 1.171*** | 1.105*** | 1.316*** | 1.866*** | 1.067*** | 1.138*** | 1.455*** | 0.912*** | 1.015*** | 1.210*** | 1.172*** | 0.791*** | 1.065*** | 1.087*** | 1.259*** | 1.029*** |
| | (0.0455) | (0.0361) | (0.0723) | (0.0419) | (0.138) | (0.0498) | (0.0421) | (0.0564) | (0.0279) | (0.0794) | (0.0309) | (0.0363) | (0.0240) | (0.0845) | (0.0317) | (0.0324) | (0.0481) |
| Ln dist | -0.643*** | -0.720*** | -0.448*** | -0.279*** | -1.618** | -0.665*** | -0.118** | -0.629*** | -0.630*** | -0.471*** | -1.089*** | -0.773*** | -0.075*** | -0.469*** | -0.824*** | -0.770*** | -0.884*** |
| | (0.0761) | (0.0785) | (0.0878) | (0.0622) | (0.646) | (0.0679) | (0.0531) | (0.104) | (0.0521) | (0.0961) | (0.0540) | (0.0639) | (0.0278) | (0.0934) | (0.0833) | (0.0471) | (0.0536) |
| Intra | 2.497*** | 4.587*** | 4.808*** | 3.981*** | -0.0370 | 4.237*** | 4.879*** | 5.091*** | 2.823*** | 2.810*** | 3.769*** | 3.497*** | 3.823*** | 4.397*** | 4.142*** | 3.506*** | 4.686*** |
| | (0.152) | (0.115) | (0.170) | (0.182) | (1.957) | (0.169) | (0.105) | (0.160) | (0.118) | (0.243) | (0.104) | (0.131) | (0.0844) | (0.209) | (0.206) | (0.106) | (0.188) |
| Contig | 0.631*** | 0.233*** | 0.688*** | | | 0.833*** | 1.456*** | 1.077*** | -0.0396 | -0.299* | -0.674*** | 0.813*** | 0.270*** | 0.118 | 0.514*** | 0.732*** | 0.758*** |
| | (0.0866) | (0.0671) | (0.0999) | | | (0.133) | (0.0649) | (0.107) | (0.0933) | (0.181) | (0.0565) | (0.0436) | (0.0550) | (0.155) | (0.131) | (0.0630) | (0.0968) |
| Constant | -7.297*** | -6.691*** | -7.131*** | -9.973*** | -9.485* | -5.381*** | -9.477*** | -12.78*** | -0.924 | -3.736*** | -5.335*** | -5.769*** | -2.074*** | -6.355*** | -5.194*** | -7.648*** | -4.748*** |
| | (0.914) | (0.852) | (1.011) | (1.039) | (5.307) | (0.877) | (0.940) | (1.103) | (0.589) | (1.179) | (0.571) | (0.474) | (0.449) | (1.385) | (0.823) | (0.533) | (0.924) |
| Observ. | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 |
| $R^2$ | 0.999 | 0.999 | 0.999 | 0.995 | 0.969 | 0.997 | 0.998 | 0.997 | 0.999 | 0.997 | 0.998 | 0.999 | 0.999 | 0.998 | 0.999 | 0.999 | 0.998 |
| Dest.FE | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Exporter | Andalucía | Aragón | Asturias | Balears | Canarias | Cantabria | Castilla y León | Castilla-La Mancha | Cataluña | C.Valenc. | Extrem | Galicia | Madrid | Murcia | Navarra | P. Vasco | Rioja |
| Importer | All | All | All | All | All | All | All | All | All | All | All | All | All | All | All | All | All |
| Est. procedure | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table 2.7. Results for each Spanish region. Aggregate flows (Restaurants + Accommodation + Travel Agencies). OLS estimates. Monetary units (€). 2000-2009**

| Model<br>Var. | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ln gdp_d | 1.054*** | 1.006*** | 0.934*** | 1.178*** | 1.275*** | 0.956*** | 0.969*** | 1.165*** | 0.838*** | 0.853*** | 1.129*** | 1.034*** | 0.784*** | 0.947*** | 1.038*** | 1.145*** | 0.996*** |
| | (0.0278) | (0.0296) | (0.0348) | (0.0415) | (0.0481) | (0.0338) | (0.0396) | (0.0489) | (0.0295) | (0.0494) | (0.0355) | (0.0253) | (0.0221) | (0.0581) | (0.0327) | (0.0348) | (0.0405) |
| Ln dist | -0.492*** | -0.661*** | -0.227*** | -0.267*** | -0.147 | -0.770*** | -0.0862 | -0.458*** | -0.540*** | -0.480*** | -0.977*** | -0.503*** | -0.0679 | -0.444*** | -0.639*** | -0.615*** | -0.775*** |
| | (0.0606) | (0.0542) | (0.0513) | (0.0748) | (0.396) | (0.0436) | (0.0587) | (0.0593) | (0.0494) | (0.0778) | (0.0840) | (0.0482) | (0.0417) | (0.0975) | (0.0542) | (0.0452) | (0.0476) |
| Intra | 2.960*** | 4.584*** | 5.255*** | 3.942*** | 4.251*** | 3.895*** | 4.815*** | 5.120*** | 3.180*** | 3.245*** | 3.968*** | 4.086*** | 3.887*** | 4.717*** | 4.558*** | 3.918*** | 4.869*** |
| | (0.147) | (0.146) | (0.173) | (0.241) | (1.221) | (0.154) | (0.174) | (0.189) | (0.155) | (0.253) | (0.211) | (0.141) | (0.135) | (0.325) | (0.178) | (0.162) | (0.186) |
| Contig | 0.517*** | 0.189** | 0.852*** | | | 0.728*** | 1.156*** | 0.928*** | 0.200** | 0.277** | -0.464*** | 0.902*** | 0.328*** | 0.695*** | 0.727*** | 0.735*** | 0.649*** |
| | (0.0768) | (0.0765) | (0.0863) | | | (0.0840) | (0.0738) | (0.0878) | (0.0849) | (0.116) | (0.118) | (0.0726) | (0.0662) | (0.144) | (0.112) | (0.0854) | (0.0975) |
| Constant | -4.453*** | -4.210*** | -5.629*** | -7.375*** | -10.26*** | -2.974*** | -6.572*** | -8.478*** | -0.324 | -1.297 | -4.702*** | -5.147*** | -2.026*** | -4.907*** | -5.614*** | -6.699*** | -4.785*** |
| | (0.680) | (0.593) | (0.607) | (0.953) | (3.246) | (0.562) | (0.841) | (0.792) | (0.517) | (0.981) | (0.837) | (0.456) | (0.394) | (1.281) | (0.648) | (0.601) | (0.709) |
| Observ. | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 | 170 |
| $R^2$ | 0.969 | 0.959 | 0.940 | 0.912 | 0.902 | 0.946 | 0.923 | 0.926 | 0.967 | 0.887 | 0.948 | 0.972 | 0.977 | 0.887 | 0.953 | 0.961 | 0.936 |
| Dest.FE | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Exporter | Andalucía | Aragón | Asturias | Balears | Canarias | Cantabria | Castilla y León | Castilla-La Mancha | Cataluña | C.Valenc. | Extrem | Galicia | Madrid | Murcia | Navarra | P. Vasco | Rioja |
| Importer | All | All | All | All | All | All | All | All | All | All | All | All | All | All | All | All | All |
| Est. procedure | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

**Table 2.8. Results for Restaurants + Accommodation generated by trips, overnights and excursion for each category. 2000-2009. PPML**

| Var. | (1) H | (2) Ap | (3) Camp | (4) Rural | (5) Friends | (6) 2ndH | (7) Exc | (8) Pernct1 | (9) Pernct2 |
|---|---|---|---|---|---|---|---|---|---|
| Ln dist | -0.318*** | -0.641*** | -0.800** | -0.856*** | -0.646*** | -0.777*** | -0.621* | -0.420*** | -0.613*** |
| | (0.120) | (0.202) | (0.318) | (0.211) | (0.164) | (0.298) | (0.326) | (0.128) | (0.199) |
| Intra | 0.756** | 1.002* | 1.172* | 0.338 | 0.509 | 1.173 | 2.001** | 0.865** | 1.197** |
| | (0.341) | (0.541) | (0.653) | (0.409) | (0.455) | (0.721) | (0.892) | (0.356) | (0.546) |
| Contig | 0.0601 | -0.282 | -0.261 | 0.0555 | 0.171 | 0.159 | 0.249 | 0.0334 | 0.179 |
| | (0.146) | (0.325) | (0.401) | (0.197) | (0.202) | (0.312) | (0.627) | (0.175) | (0.290) |
| Constant | 16.07*** | 15.16*** | 16.26*** | 14.12*** | 18.95*** | 19.03*** | 17.93*** | 16.74*** | 19.59*** |
| | (0.844) | (1.429) | (2.100) | (1.469) | (1.136) | (2.044) | (2.261) | (0.908) | (1.402) |
| Observa. | 2,890 | 2,720 | 2,720 | 2,720 | 2,890 | 2,805 | 2,890 | 2,890 | 2,890 |
| R-squared | 0.837 | 0.919 | 0.941 | 0.746 | 0.699 | 0.630 | 0.658 | 0.853 | 0.686 |
| Dependent variable | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays |
| Origin FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Origin time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Destination FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Destination time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation procedure | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML | PPML |

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Pernct1: Hotels, apartments, campings, rural tourism
Pernct2: Include all flows together as they are obtained in the bottom-up process, without the final adjustment to National Accounts.

**Table 2.9. Results for Restaurants + Accommodation monetary flows generated by trips, overnights and excursion for each category. 2000-2009. OLS**

| VARIABLES | (1) H | (2) Ap | (3) Camp | (4) Rural | (5) Friends | (6) 2ndH | (7) Exc | (8) Pernct1 | (9) Pernct2 |
|---|---|---|---|---|---|---|---|---|---|
| Ln dist | -0.488*** | -0.665*** | -0.991*** | -0.649*** | -1.019*** | -1.606*** | -2.041*** | -0.532*** | -0.645*** |
| | (0.0887) | (0.143) | (0.215) | (0.169) | (0.213) | (0.397) | (0.378) | (0.0939) | (0.123) |
| Intra | -0.152 | -0.398 | -0.389 | 0.0624 | -0.471 | -0.361 | 0.355 | -0.143 | 0.00298 |
| | (0.310) | (0.433) | (0.610) | (0.534) | (0.731) | (1.387) | (1.415) | (0.319) | (0.477) |
| Contig | 0.0491 | -0.0747 | -0.0287 | 0.0339 | 0.339 | 0.437 | 1.231*** | 0.0452 | 0.143 |
| | (0.0936) | (0.145) | (0.212) | (0.165) | (0.254) | (0.515) | (0.464) | (0.0971) | (0.137) |
| Constant | 14.59*** | 12.58*** | 13.87*** | 9.440*** | 17.13*** | 16.29*** | 16.64*** | 15.12*** | 15.88*** |
| | (0.658) | (0.973) | (1.442) | (1.150) | (1.503) | (2.856) | (2.609) | (0.683) | (0.875) |
| Observa. | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 |
| R-squared | 0.893 | 0.881 | 0.810 | 0.796 | 0.601 | 0.437 | 0.445 | 0.879 | 0.807 |
| Dependent variable | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) | Flows (€) |
| Origin FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Origin time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Destination FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Destination time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation procedure | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS |

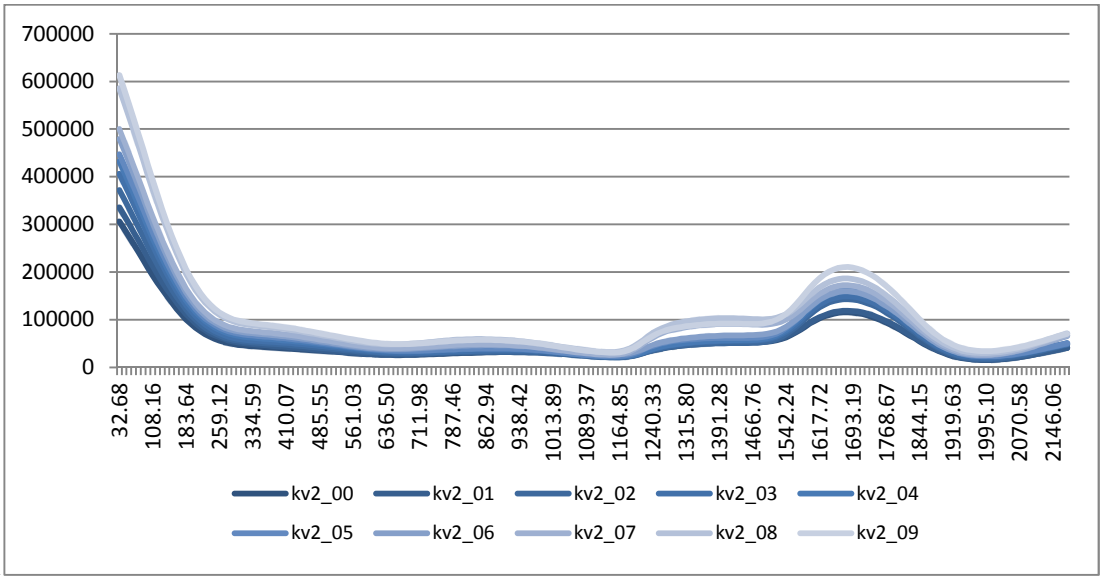
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Pernct1: Hotels, apartments, campings, rural tourism
Pernct2: Include all flows together as they are obtained in the bottom-up process, without the final adjustment to National Accounts.

**Table 2.10. Results for Restaurants + Accommodation generated by trips, overnights and excursion for each category. 2000-2009. OLS**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| VARIABLES | H | Ap | Camp | Rural | Friends | 2ndH | Exc | Pernct1 | Pernct2 |
| Ln dist | -0.488*** | -0.694*** | -1.096*** | -0.680*** | -1.344*** | -2.331*** | -3.139*** | -0.558*** | -0.819*** |
| | (0.0887) | (0.145) | (0.258) | (0.185) | (0.269) | (0.580) | (0.549) | (0.104) | (0.165) |
| Intra | -0.152 | -0.460 | -0.499 | 0.000301 | -0.948 | -0.893 | -0.472 | -0.134 | 0.0437 |
| | (0.310) | (0.440) | (0.622) | (0.558) | (0.888) | (1.942) | (1.863) | (0.355) | (0.636) |
| Contig | 0.0494 | -0.0803 | -0.0701 | -0.0211 | 0.390 | 0.632 | 1.618** | 0.0470 | 0.245 |
| | (0.0936) | (0.151) | (0.222) | (0.180) | (0.330) | (0.760) | (0.679) | (0.109) | (0.192) |
| Constant | 17.10*** | 15.81*** | 18.09*** | 12.55*** | 24.34*** | 24.63*** | 26.80*** | 17.66*** | 20.58*** |
| | (0.659) | (0.990) | (1.719) | (1.253) | (1.981) | (4.209) | (3.829) | (0.753) | (1.159) |
| Observa. | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 | 2,890 |
| R-squared | 0.889 | 0.904 | 0.860 | 0.811 | 0.559 | 0.420 | 0.469 | 0.869 | 0.720 |
| Dependent variable | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays | Trips or overnight stays |
| Origin FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Origin time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Destination FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Destination time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation procedure | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS | OLS |

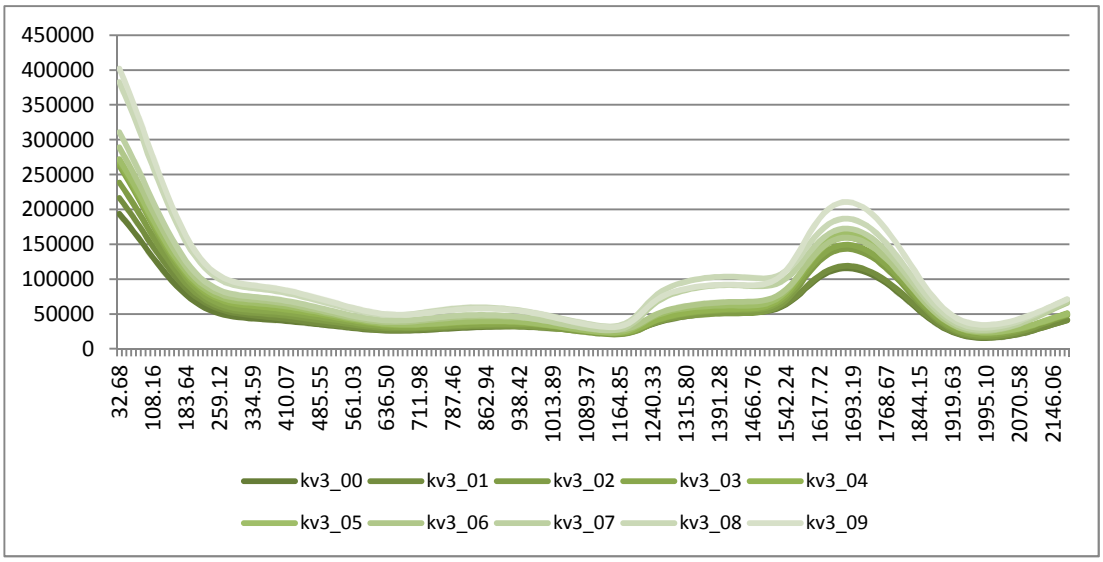
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Pernct1: Hotels, apartments, campings, rural tourism
Pernct2: Include all flows together as they are obtained in the bottom-up process, without the final adjustment to National Accounts.

**Total flows (Accommodation +Restaurants + Travel Agencies) without Restaurants not linked to trips.**



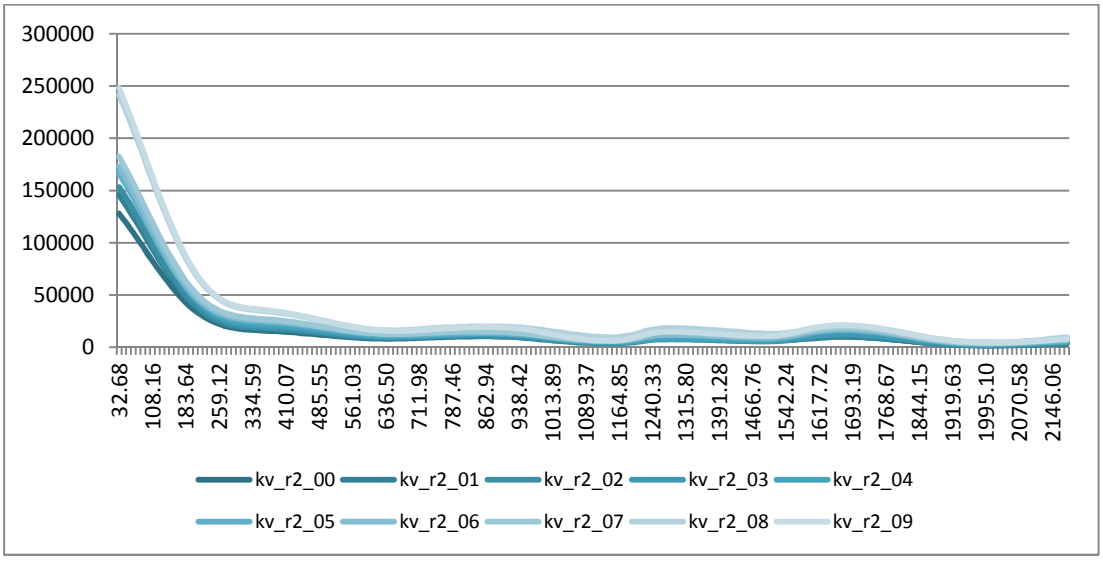

**A**

**Total flows (Accommodation +Restaurants) without Restaurants not linked to trips.**

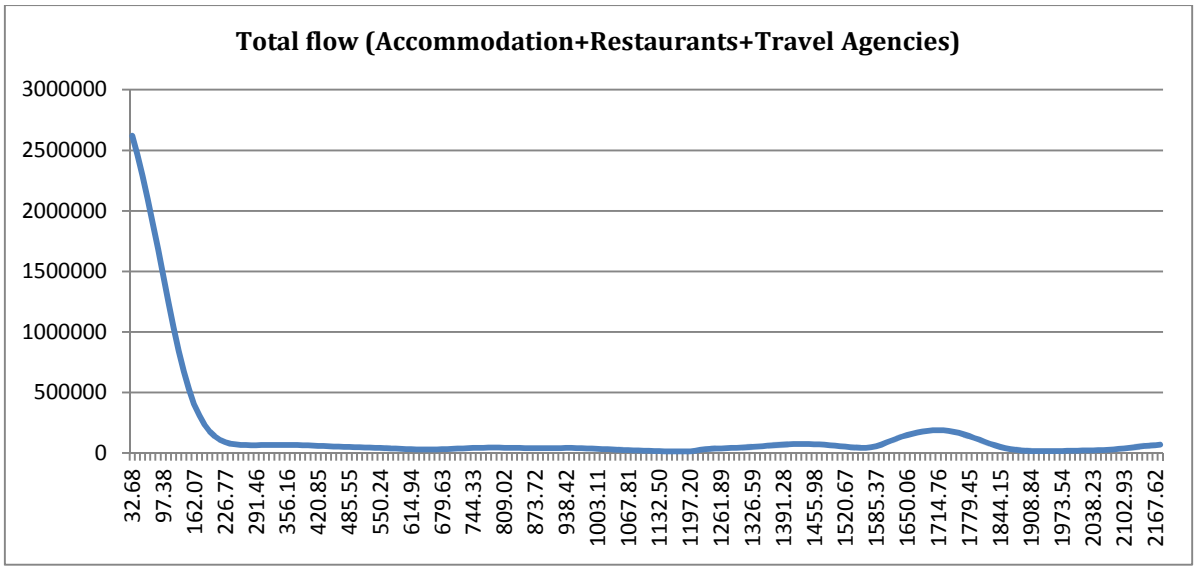


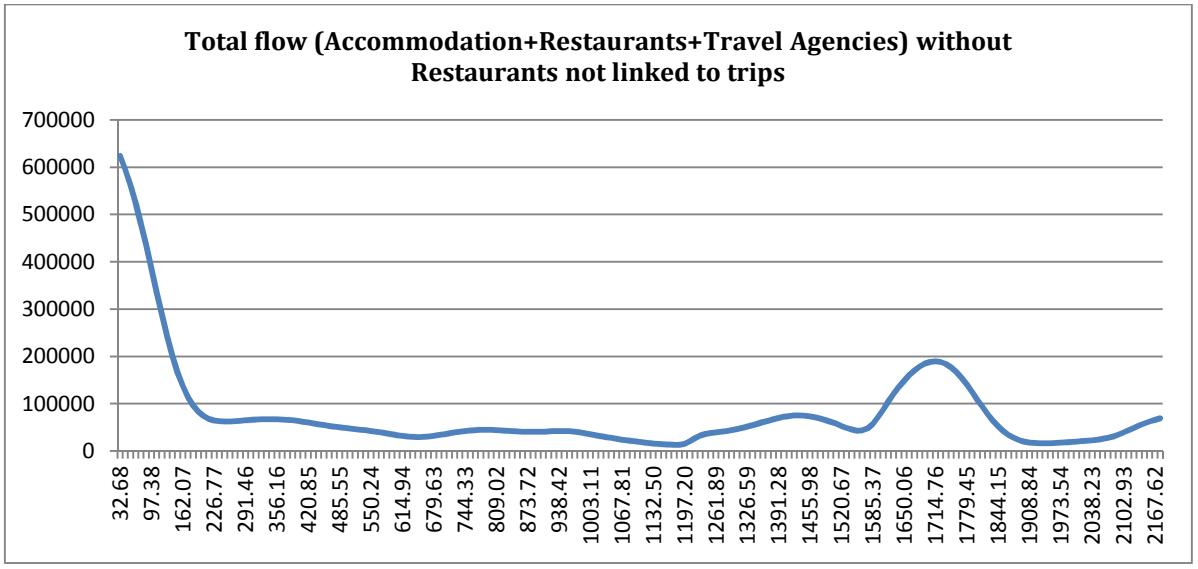

**B**

**Restaurants without the consumption not linked to trips.**




**C**


Total flow (Accommodation+Restaurants+Travel Agencies)
3000000
2500000
2000000
1500000
1000000
500000
0
32.68
97.38
162.07
226.77
291.46
356.16
420.85
485.55
550.24
614.94
679.63
744.33
809.02
873.72
938.42
1003.11
1067.81
1132.50
1197.20
1261.89
1326.59
1391.28
1455.98
1520.67
1585.37
1650.06
1714.76
1779.45
1844.15
1908.84
1973.54
2038.23
2102.93
2167.62


Total flow (Accommodation+Restaurants+Travel Agencies) without Restaurants not linked to trips
700000
600000
500000
400000
300000
200000
100000
0
32.68
97.38
162.07
226.77
291.46
356.16
420.85
485.55
550.24
614.94
679.63
744.33
809.02
873.72
938.42
1003.11
1067.81
1132.50
1197.20
1261.89
1326.59
1391.28
1455.98
1520.67
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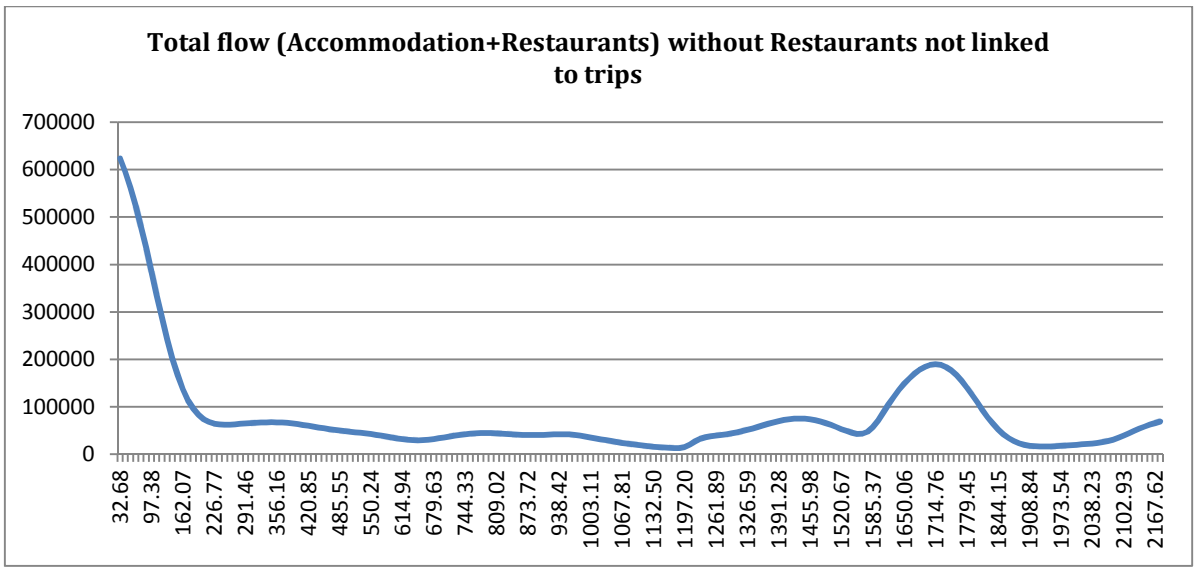
1908.84
1973.54
2038.23
2102.93
2167.62


Total flow (Accommodation+Restaurants) without Restaurants not linked to trips
700000
600000
500000
400000
300000
200000
100000
0
32.68
97.38
162.07
226.77
291.46
356.16
420.85
485.55
550.24
614.94
679.63
744.33
809.02
873.72
938.42
1003.11
1067.81
1132.50
1197.20
1261.89
1326.59
1391.28
1455.98
1520.67
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1650.06
1714.76
1779.45
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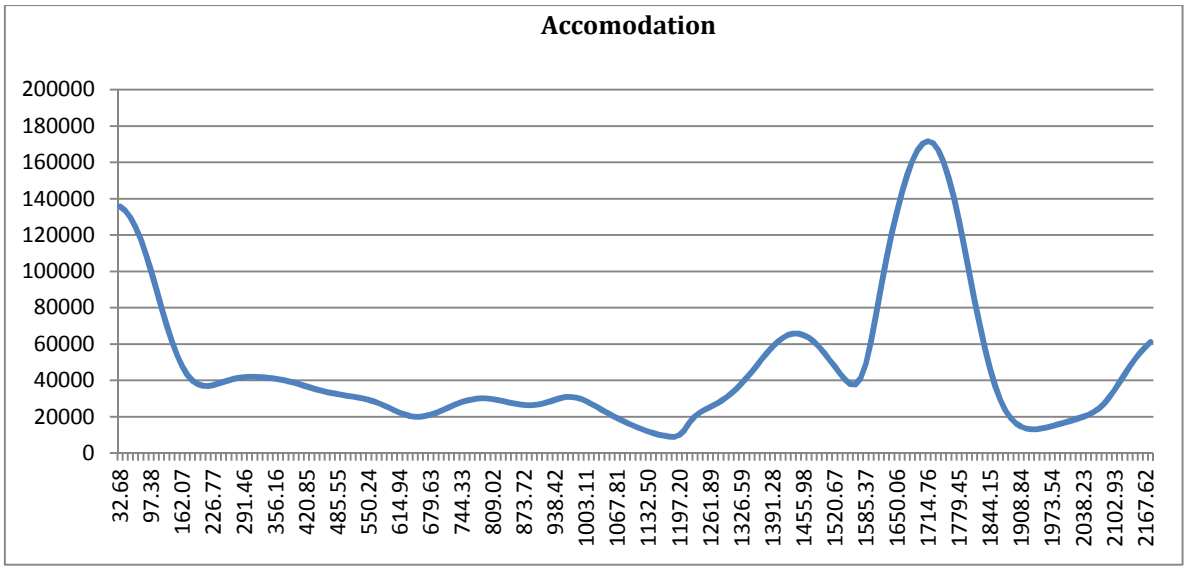
1908.84
1973.54
2038.23
2102.93
2167.62


Accomodation
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
32.68
97.38
162.07
226.77
291.46
356.16
420.85
485.55
550.24
614.94
679.63
744.33
809.02
873.72
938.42
1003.11
1067.81
1132.50
1197.20
1261.89
1326.59
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1844.15
1908.84
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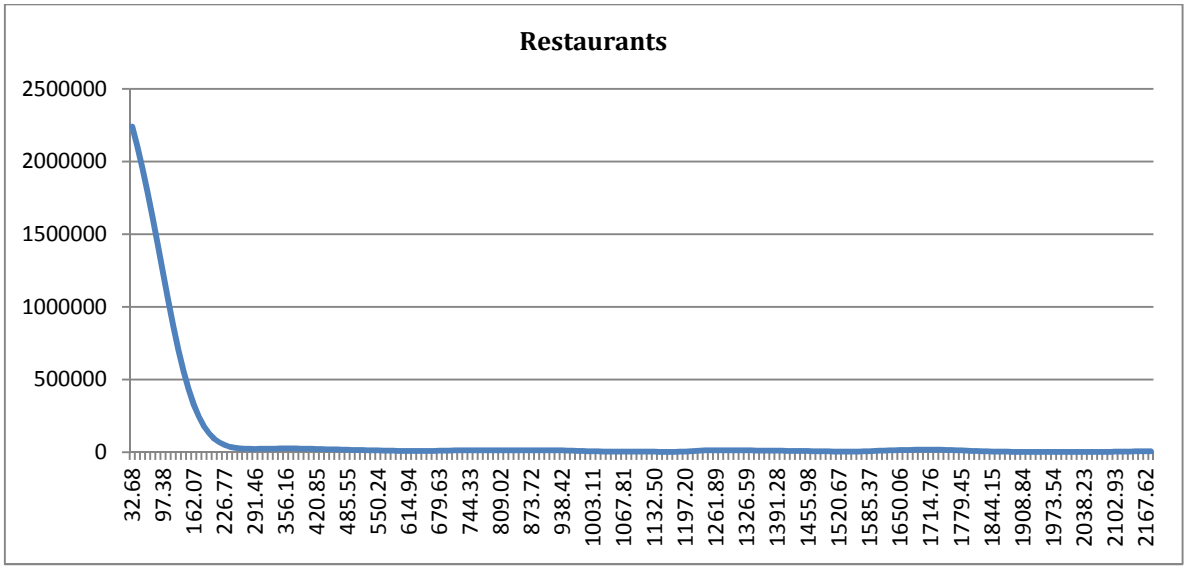
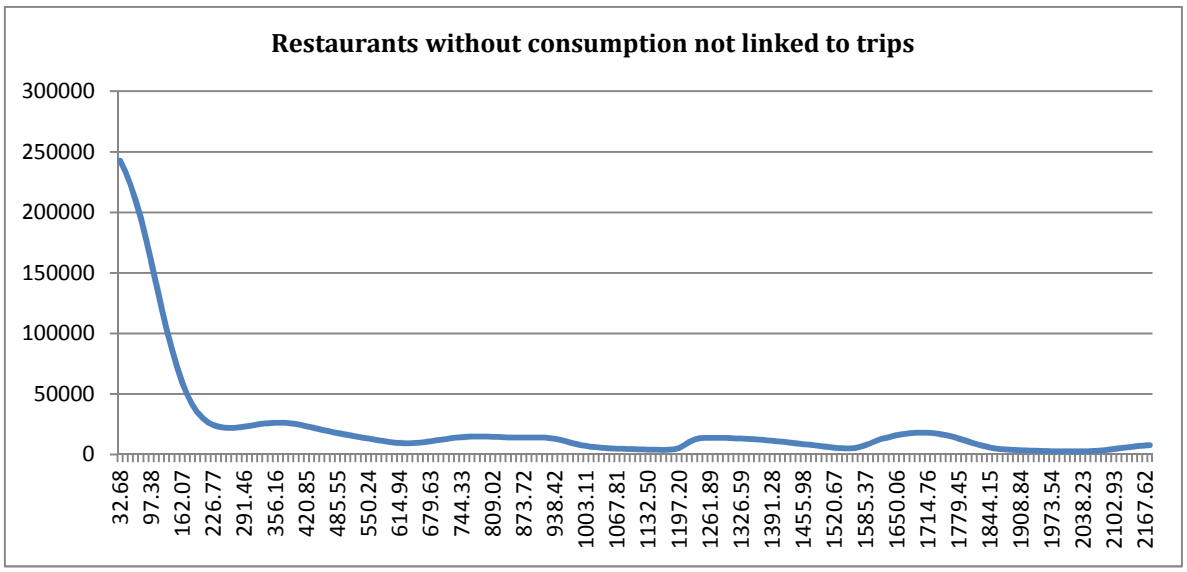
2038.23
2102.93
2167.62


Restaurants
2500000
2000000
1500000
1000000
500000
0
32.68
97.38
162.07
226.77
291.46
356.16
420.85
485.55
550.24
614.94
679.63
744.33
809.02
873.72
938.42
1003.11
1067.81
1132.50
1197.20
1261.89
1326.59
1391.28
1455.98
1520.67
1585.37
1650.06
1714.76
1779.45
1844.15
1908.84
1973.54
2038.23
2102.93
2167.62


Restaurants without consumption not linked to trips
300000
250000
200000
150000
100000
50000
0
32.68
97.38
162.07
226.77
291.46
356.16
420.85
485.55
550.24
614.94
679.63
744.33
809.02
873.72
938.42
1003.11
1067.81
1132.50
1197.20
1261.89
1326.59
1391.28
1455.98
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1585.37
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2038.23
2102.93
2167.62

# 3. Does trade creation by social and business networks hold in services? An analysis for Accommodation and Restaurants in Spain

## 3.1. Introduction

Although according to the literature of gravity models, two countries or regions tend to trade more with closer countries or regions, the steady reduction in transportation costs and other factors such as social and business networks can help to overcome trade barriers as distance. As Gould (1994) points out "Immigrant links to the home country include knowledge of home-country markets, language, preferences, and business contacts. Immigrant links suggest a beneficial human capital type of externality that enhances trading opportunities between the host and home countries".

Rauch (2001) also noted that a positive impact of immigration on trade might simply reflect immigrant's taste for goods from their countries of origin, or the correlation of immigration with country characteristics that promote trade, such as proximity. However, different authors have demonstrated that besides this "taste effect," there is a "network effect" induced by the social linkages that immigrants keep with their countries of origin, which may induce important reductions in transaction costs and, therefore, further promotions of bilateral trade. Regarding this mechanism, some authors have tried to quantify the relevance of social and business networks on the international trade of goods between countries (Gould (1994), Dunlevy and Hutchinson (1999; 2001), Girma and Yu (2002), White and Tadesse (2008), Peri and Requena (2010), etc.)

The literature about the relation between these two phenomena at the interregional level is very scarce. Among the exceptions, Helliwell (1997) analyzed the interregional and international trade of Canada and the US, finding that the role of interregional migration plays a minor role compared to the international migration, since the "taste and information effects" are smaller between regions than between countries. More recently, Combes et al. (2005) quantified the impact of social and business networks on the intensity of interregional trade between 94 French regions (departments). In this paper, by means of different gravity models, embedded in a Dixit–Stiglitz–Krugman theoretical framework, the authors verify that despite the traditional impediments to trade (distance and boundaries), networks facilitate bilateral trade, finding larger effects for business than for social networks.

The empirical evidence related to the presence of firms of the same group as a trade enhancing factor is rather limited. Among the exceptions, Belderbos and Sleuwaegen (1998) show that the share of production exported to the European Union (EU) by a Japanese electronics firm is substantially higher if this firm is a component subcontractor in a vertical keiretsu, and if the parent firm has previously invested in the EU. Their results suggest that membership of a keiretsu network facilitates trade between member firms at the expense of outsiders, although it is unclear whether this effect comes from increased efficiency or exclusionary behavior. Based on this literature, Combes et al. (2005) focused on the trade creation effect of business networks for the internal trade in France, considering the links between plants belonging to the same business group. For the case of Spain, Garmendia et al. (2005) using domestic flows in Spain, found a large internal border effect that tends to disappear once we take into account the higher density of social and business networks within regions.

Also, as reviewed in the previous chapter, few authors have used the gravity model to analyse the bilateral trade flows of services. Kimura and Lee (2006) using panel data from the OCDE international trade of services database for the period 1999–2000, found a strong negative elasticity of distance and that "language and cultural proximity between producer and consumer" play an important role in determining the intensity of international trade of services. This result is in line with the "information effect" described above for the relation between social and business networks and the international trade of goods. Apart from the information channel, given that services are more differentiated than goods, trade in services is expected to be more influenced by migration than goods through the taste channel. In services, personal contact is essential (as illustrated by the 'proximity burden' described by Christen and Francois, 2009); then, as the face-to-face relationship is very important, factors reducing transaction costs (information costs, cultural differences…) should play a larger role in services than in goods. However, to the best of our knowledge, there is no evidence of the effect of social and business networks on trade in services.

Helliwell (1997) argued that given that institutions might be more different across countries than between regions within the same country, the trade creation effect of migrants should be bigger on international than on interregional trade. However, several papers (Combes et al., 2005; Millimet and Osang, 2007; Garmendia et al., 2012) have found that even at the regional level, the presence of networks can explain a part of the border effect puzzle. One may think that the information or transaction costs at the interregional level are close to zero. In that case, it is possible to argue that the information effect is expected to be close to zero. However, social networks can foster the creation of ties that will be larger the higher the number of people you know, and the deeper the relationships enhancing commercial exchanges. Even if there is perfect information, there might be something else that you will need to attract people to consume your products or services.

Focusing on the link between tourism and migration at the international level, the network effects could be reduced by the high cost of traveling back to the home country. However, when the analysis focuses on domestic trips, we might expect to see higher magnitudes of flows. For example, in the US cumulated moves over the six-year period from 1995 to 2000 involved 112 million people, of which 22 million involved moves between states. This suggests an interstate migration rate for this period of 8.4%, with an inter-county migration rate of 24.9% (Perry and Schachter, 2003). Mobility of Spanish citizens is such that only 16% of the population lives in a region different from that in

which they were born. An important distinction between interregional and international movement of citizens is that lodging expenses may be lowered by ownership of "second residences" or the ability to "share" accommodation with relatives and friends in the case of interregional flows of visitors. This not only increases potential savings on "transaction costs", but also on prices (even acting as a substitute of the firms providing services as lodges). These results are induced by the presence of "social networks" that would also exist in the case of international tourism flows. Despite these intuitively appealing reasons to believe that the potential for significant relationships between trade flows of services linked with tourism activity and stocks of immigrants in the interregional case is greater than for international tourism, the lack of information has limited the ability to empirically explore these hypotheses on interregional tourism flows.

Regarding business networks, flows of services related with tourism activities are excepted be more intensive between regions and countries that share common infrastructures, business groups and intermediaries (transportation networks, business trips, common tour operators, etc.). Additionally, in terms of social networks there are several mechanisms that could induce a positive correlation between trade and the intensity of the demographic linkages.

In what follows the effect of migration and firms' links in trade of Accommodation and Restaurants has been econometrically estimated and analyzed considering them as a group and each sector separately, demonstrating that the effects are different depending on the characteristics of the sector considered. From an empirical point of view, we rely on the contribution of Combes et al (2005) who introduce social and business networks as explanatory variables of interregional trade flows into the well-known Dixit–Stiglitz–Krugman (DSK) framework. With this aim a gravity model is estimated for a unique dataset on the interregional trade flows in Spain for the period 2000–09, measured in monetary units. Different results for Accommodation and Restaurants are obtained for social networks and a smaller effect for business network. A similar analysis has been also carried out for goods where the trade creation effect of social and business networks in goods as been ascertained, and test to what extent these effects are similar in the case of services, controlling for their different characteristics, the way they are delivered, and the forces that drive its demand and who is consuming each product or the service. To carry out the comparison we use the same data dataset on goods and services concerning the level of disaggregation in the data, the period analyzed, the methodology, and the same

econometric specification. Additionally, the endogeneity problem has been tackled using the instrumental variables version of the Pseudo Poisson Maximum Likelihood Estimator.

The results obtained confirm the trade creation effect of social and business networks for trade in services, but with a heterogeneous behavior in each sector. The business networks have a larger effect on trade in goods than in services. The social networks have a larger effect on Restaurants that is affected both by immigrants and emigrants, while accommodation is just affected by the stock of immigrants, while goods are just influenced by the stock of emigrants.

Section 2 presents the gravity model as the proper framework to analyze the factors that determine the structure of bilateral flows. This section also defines the main channels through which we expect to find enhancing effects of social and business networks on the interregional trade of the two service sectors comprised in the dataset. Section 3 presents the main characteristics of the dataset used. Empirical results obtained from applying the model to interregional trade flows in Spain are presented and discussed in Section 5.

## 3.2. The gravity model and social and business networks in trade in touristic services

### 3.2.1. The gravity model

Combes et al (2005) present a gravity model rooted in the DSK framework. According to this model (see the **Appendix** for further details) the demand function of region *i* for touristic services offered by region *j* is described by

$$T_{ijt} = T_{it} P_{it}^{\sigma} n_{jt} p_{jt}^{-\sigma} a_{ijt}^{\sigma-1} (1+\tau_{ijt})^{-\sigma} \quad (1)$$

and migration variables influence trade through preferences and information channels. Eq. (1) links trade between regions *j* and *i* at a moment *t* as a function of the size of the demand in region *i* ($T_{it}$), its price index $P_{it}$, the size of the supply $n_{jt}$, the mill price of the origin region *j* ($p_j$), and bilateral characteristics related with preferences ($a_{ijt}$) and transaction costs ($\tau_{ijt}$). The unobservable variables, $P_{it}$, $n_{jt}$, and $P_{jt}$., are generated by regional invariant factors and also by time-variant endowments in each region. Then, it is

possible to derive a gravity equation from eq (1) replacing all time-specific, destination-specific, origin-specific, time-destination specific, and time-origin specific variables by fixed effects. Traditionally a log linearization was done and then, the following equation was estimated:

$$\ln T_{ijt} = \beta_0 + \beta_1 \ln dist_{ij} + \beta_2 cont_{ij} + \beta_3 \ln mig_{ijt} + \beta_4 \ln mig_{jit} + \beta_5 \ln firms_{ijt} + \delta_i + \delta_j + \delta_t + \delta_{it} + \delta_{jt} + u_{ijt} \quad (2)$$

Where $\beta_2$, $\beta_3 = \sigma \cdot \alpha_I + (\sigma - 1) \cdot \alpha_a$; $\beta_4$, $\beta_5 = \sigma \cdot \gamma_I$ and $\ln T_{ijt}$ contains the logarithm of the imports of each region *i* of services from each region *j* in monetary units for each year *t* in the period 2000–09; *ln* $dist_{ij}$ contains the logarithm of the actual average distance travelled between *i* and *j*; $cont_{ij}$ is a dummy for contiguity regions; *ln mig* is the interregional stock of migrants from or to a different region in logarithms, and *ln firms* is the logarithm of the number of connections between firms in different regions belonging to the same business group.

However, Santos-Silva and Tenreyro (2006) developed an alternative method to the log-normal transformation, the Pseudo-Poisson Maximum Likelihood (PPML). This procedure has been widely used in order to treat the well-known problem of the high number of zero flows in trade. In addition, as Santos-Silva and Tenreyro (2006; 2011) and Arvis and Shepherd (2011) have proven that the log normal transformation yields biased and inconsistent estimations in the presence of heteroskedasticity, even when there is not a problem of a large amount of zero flows[16]. Furthermore, Arvis and Shepherd (2011) showed that the PPML produces estimates in which, summing across all partners, estimated total trade flows are equal to the actual ones. They argued that this is a desirable property of this estimator. Then, according to Santos-Silva and Tenreyro (2006), constant-elasticity models, as the gravity models, should be estimated in their multiplicative form:

$$E[T_{ijt} \mid Z_{ijt}] = \beta_0 * \ln dist_{ij}^{\beta_1} * \ln mig_{ijt}^{\beta_2} * \ln mig_{jit}^{\beta_3} * \ln firms_{ijt}^{\beta_4} * \exp^{\beta_5 * contig + \delta_i + \delta_j + \delta_t} \quad (3)$$

With $Z_{ijt} = \left[ \ln mig_{ijt}, \ln mig_{jit}, \ln firms_{ijt}, \ln dist_{ij}, contig_{ij}, \delta_i, \delta_j, \delta_t \right]$.

### 3.2.2. The interaction between networks and tourism flows

[16] One of the arguments is that due to Jensen's inequality [E(ln y) ≠ ln E (y)], the interpretation of the parameters of log-linearized models as elasticities can be misleading in the presence of heteroskedasticity.

For generality and simplicity, this section describes concepts related to international and interregional trade and the role of migration flows. For this purpose, an immigrant is defined as an individual who was born in a different region ("homeland region") from his current region of residence ("host region"). Note also that, when considering interregional monetary flows of the services sectors linked with tourism activity, an "exporting region" is the one producing the service, in this case the region receiving the tourists.

Focusing on the tourism sector, there are several channels that may lead to a positive relationship between the intensity of trade and the presence of social networks. The channels observed are the following:

- The destination choice of immigrants is conditioned by familiar ties with their homeland. Since people may own homes or have access to property in the regions where they were born, they normally take advantage of vacations to visit their homelands. This should produce larger number of trips from a host region to the hometowns of immigrants. This effect will be called "emigrants effect" on exports. This is related with the information and taste channels described for goods.
- Conversely, relatives and friends living in the homeland (people that has not migrated) may tend to visit immigrants in the host region, since these visits are made easier by access to information and less expensive dwelling options than other possible tourism destinations. This effect will be called the "immigrants effect" on exports, and is in line with the information channel (sometimes related with the contract enforcement) described for trade in goods.
- In connection with the network channel, immigrants could also affect "tourism decisions" of other non-immigrants living in the host region. For example, if we think of the large number of immigrants who form families with natives in a region, it is easy to suppose that there is an influence on immigrant tourism decisions arising from family ties that exert and influence on non-immigrants. For example, in the case of a "mixed couple" (immigrant and non-immigrant) with two children, the decision to visit a relative in the homeland of the immigrant is conditioning the travel decisions of three "non-immigrants." Moreover, relatives and friends of the immigrants who are still living in the homeland region (but could interact regularly with them) could also spread their travel experiences and tastes among their co-nationals in the homeland.

- Finally, we could find an effect that is related with the previous ones but acts in an opposite way. For some sectors, if the members of the social network (instead of firms) are the ones that provide the services, the number of trips between the home and host region will increase but there will not be a trade enhancement in values. For example, if the members of a family, living in different regions, travel to expend some days to their home-town where other relatives are still living or travel to a region where a member of the family owns a second home and they stay in their relatives' homes, the members of the family provide the accommodation service. Then, the number of arrivals to this region will increase, but there will not be a trade creation for firms providing the lodging service, because it is freely *provided* by the social network. For sectors that produce other services (i.e. restaurants, bars, retail, transportation, etc.) the consumption might be increased because the region is able to attract more people, given the savings in one of the products (i.e. accommodation). However, the firms providing the accommodation service will not be positively affected since the members of the social network *offer* the service.

In addition, the interregional trade flows of the Restaurants and the like and Hostel industry (Accommodation) in a country could also benefit from the presence of business networks in this sector, but also in the Transport sector:

- For example, taking into account that a share of tourist flows are business trips, one may expect to find more intense interaction between the people working in regions whose companies have some kind of connection, due to trade, financial, or administrative links.
- Furthermore, one may expect to find more intense tourist flows between regions that share common tour operators, or regions that are connected by the presence of hotel and transportation holdings. Quite often, these holdings offer tourist packages for visiting accommodations belonging to the same chain in alternative regions, or offer discounts for travelling with haulers that also belong to the business group.

## 3.3. Data

### 3.3.1. The interregional trade flows

The aim of this section is to describe the unique dataset used in this paper, which contains intraregional and interregional bilateral trade flows in monetary units for the period 2000–2009 for the Restaurants and Accommodation in Spain. For the sake of clarity, a brief description of the process is offered here but a detailed description of the method used for estimating such a database was included in the previous chapter of this dissertation.

The methodology can be summarized in two steps: 1) Estimating the share of output produced in each sector consumed by Spanish residents for each of the 18 Spanish regions; 2) Determining for each region the bilateral distribution of the former.

Regarding the *first step*, the vector of regional production consumed by domestic demand can be obtained by combining existing information on the regional net production both at the national level (National Accounts and *Input-Output Tables*) and at the NUTS2 level (*Spanish Annual Service Survey*, SASS from the Instituto Nacional de Estadística, INE), as well as data on the international exports of the sector coherent with the *Spanish Balance of Payments* (SBP).

Regarding the *second step*, for each year in the period 2000–2009, the procedure is the following:

First of all, we research the domestic trips made by individuals that can result in expenditures in the two sectors considered, using the main statistical sources available in Spain on the topic (*Occupancy Surveys*, INE; *Familitur Survey*, Instituto de Estudios Turísticos-IET). We differentiate between overnight stays in four different types of regulated establishments, such as Hotels, Apartments, Campsites, and Rural Tourism establishments (*Occupancy Surveys*, INE). Separately, we consider overnight stays at "second homes" and "homes owned by friends and relatives" (*Familitur Survey*, IET). In addition, the domestic excursions obtained from *Familitur Survey* (IET) are also considered. All these categories of flows are treated separately, imputing alternative unit expenses regarding the Restaurants and Accommodation. The stays in regulated establishments (Hotels, Apartments, Campsites and Rural Tourism) will have an associated daily expense in Accommodation and Restaurants, while the rest of the trips will generate only consumption in Restaurants.

Secondly, the average daily expenditure incurred by residents of every region in Accommodation is estimated using data from the *Occupancy Survey* (INE). To estimate the average expense incurred in Restaurants, data concerning the average price of a meal from the surveys of the *Purchasing Power Parity* (INE) is used. We obtain a different vector of prices depending on the type of accommodation for each year.

Finally, once (i) each trip and overnight stay has been properly translated into monetary flows linked to Accommodation and Restaurants sectors, and (ii) the total flows are adjusted to the production figures obtained in the first step (for more details, see the Annex), they can be aggregated in a single origin–destination (OD) matrix, which accounts for the total interregional expenditure linked to the overnight stays or excursions.

Note that all the OD matrices obtained capture the direction of the trade flow of services rather than the movements of people. As in the Balance of Payments, the direction of the trip (people movement) is opposite to the trade flow of the service (monetary flow), that is, the expenditure generated by a German tourist in Spain represents an export from Spain to Germany. Similarly, a Spanish citizen living in Madrid who travels to Valencia generates an interregional export from Valencia to Madrid. Our final OD trade matrices are, therefore, calculated in monetary units and register the exporting regions in rows (considered as origins of the flows, which are the receptors of the people) and the importing regions in columns (that is, the regions who receive the service by sending people). We remark that this estimate for the intra and interregional trade flows in monetary units for these sectors related with tourism activity in Spain is coherent with the available statistical sources in Spain: the regional production of the sector obtained from the SASS, the international exports of the sector from the BP, and the structure of interregional overnight stays offered by the main sources available (*Familitur* and *Occupancy Surveys*).

Although a squared matrix which contains both interregional and intraregional flows is obtained, we will avoid introducing the latter intraregional flows in the analysis for two reasons: the first one is that it makes the analysis more comparable with other studies which does not include them and secondly, because there is a huge part of the intraregional flows that have a different nature than the interregional ones, given that they take into account the daily consumption in '*Restaurants and the like*' which does not imply any decision in which preferences or social and business networks have an important role, but corresponds to the place where an individual carries out his regular life. It can be said that this is the non-tradable part of the production in these services. Also, the data

obtained for Ceuta y Melilla are not included because the primary statistics available for these autonomous cities are of a very low quality, while they have a small share of the total output, so we can dismiss them in the analysis.

The results obtained for these services are going to be compared with the results obtained for the interregional trade of goods for the same period. The dataset on domestic trade on goods is also borrowed from the C-intereg project (www.c-intereg.es). Although the C-intereg project has disaggregated data for 16 sectors at the provincial level (NUTS 3) since 1995, we will consider the aggregate for all the goods since 2000 at the NUTS2 level (regions) in order to be consistent with period of time and the level of aggregation that it is available for the data on trade in services.

### 3.3.2. The distance measure

The distance variable is obtained from the 2001 edition of the Movilia survey (Ministerio de Fomento, 2001), corresponding to the actual distance travelled by Spanish residents in their displacements between regions. One of the most interesting features of this measure is that it includes not just interregional distance but also intraregional. Moreover, the distance used is an average of the actual distance travelled by each of the more than 500 million of displacements estimated by the Movilia survey in 2001. These displacements cover all motives, so the distance reported is not constrained by distance between capitals, which could be predominant for work trips but not tourist spots (beaches, skiing resorts, countryside, etc.) located in the periphery.

### 3.3.3. The social and business networks

The interregional migration matrices are obtained from the *Spanish Register* (INE) for each year, which offer information on the stock of people living in a region who were born in other regions. The effects captured by the $m_{ij}$ and the $m_{ji}$ terms enter as two independent variables.

Data on business networks has been kindly handed over by Aitor Garmendia who uses a similar variable in Garmendia et al. (2012). This has been computed from SABI (2006).

This dataset, produced by the private firm Bureau van Dijk, offers data on the accounts and balance sheets of Spanish firms. Firms that belong to the same group in the origin and destination regions can be identified. Following the Spanish General Accounting Guidelines, two firms belong to the same business group if the same shareholder has at least a 20% participation in both firms, and the shareholder is the primary shareholder in both firms. Then, the number of plants or firms belonging to the same business group in each region is calculated. We have considered the following service sectors: 'Accommodation' (NACE 93. 55.11, 55.12, 55.22, 55.23), 'Restaurants' (NACE 93. 55.30), and 'Transport' (NACE 93. 60.10, 60.21, 60.22, 60.23, 62.10, 62.20) including tour operators as well as haulers. Then, we calculate for each *ij* pair the number of potential connections within the business group multiplying the number of plants in *i* and *j*. The sum over all business groups in these services is captured by the variable $firms_{ij}$. This variable, and, therefore, the impact of plant links, is thus symmetric by construction, $firms_{ij} = firms_{ji}$. This variable is only available for 2006.

**Table 3.1 and Table 3.2** show descriptive statistics of the main variables used and their pairwise correlations. An important thing to note is that the database of trade flows in services (in thousands euros) does not present any zero flow, but for the case of goods there is a small number of zero flows, 52 over 2448 (2.12% of the total observations). It is also interesting to note that the average value of trade in the aggregate of accommodation and restaurants is just 5% of that corresponding to goods. For the migration variables, the summary statistics are the same, since one is the transposed version of the other one. The variable related with the connections between firms has a low mean.

**Table 3.1. Descriptive statistics.**

| Variable | Description | Mean | Std. Dev. | Min | Max. |
|---|---|---|---|---|---|
| **Tij** | Interregional services (accommodation+restaurants) flows | 50,941.92 | 110,064.3 | 466 | 1,504,355 |
| **Tij h** | Interregional accommodation flows | 33,584.68 | 88,538.44 | 360 | 1,369,101 |
| **Tij r** | Interregional restaurants flows | 17,602.52 | 36,747.77 | 101 | 480,378 |
| **Tij g** | Interregional goods flows | 892,522.8 | 1,271,105 | 0 | 9,568,247 |
| **mig_ij** | Emigrants | 26,162.82 | 68,653.87 | 98 | 784,618 |
| **mig_ji** | Immigrants | 26,162.82 | 68,653.87 | 98 | 784,618 |
| **fims_ij** | Plant links | 147.26 | 496.36 | 0 | 3,900 |
| **dist_ij** | Distance | 590.23 | 506.61 | 68 | 2,178 |

Summary statistics obtained without considering the values for the cases where the importing and the exporting region is the same.

From the correlations between these variables, it can be seen that the independent variable is positively correlated with each network variable. In general, the pairwise correlation between each type of social network (immigrants and emigrants) and each type of flow are very similar, while the correlation with business networks is stronger than with the migration variables for the aggregate of services and accommodation. On the other hand the correlation between all types of networks is very similar for goods trade. Finally, the correlation between domestic flows in Restaurants and the stock of emigrants is much higher than with the stock of immigrants. Although the network variables are positively correlated, the correlation is slightly lower than in other similar analysis as Combes et al. (2005). A negative relation between migration and distance is found, while a positive correlation between distance and the connections between firms is obtained. Being close to other plants in the business group can have some advantages related with the scale economies and agglomeration on trade in intermediate goods. In contrast, the present analysis is centered on some consumer services sectors where an establishment has to be set up in order to deliver the service in the area where it is located. Business groups might try to set up in different places in order to cover different geographical markets, so it is not unusual to find a positive relation between business network and distance in order to capture a larger part of the total demand.

**Table 3.2. Correlation matrix.**

| | **Tij** | **Tij h** | **Tij r** | **Tij g** | **mig_ij** | **mig_ji** | **firms_ij** |
|---|---|---|---|---|---|---|---|
| **Tij h** | 0.9556* | | | | | | |
| **Tij r** | 0.7111* | 0.4731* | | | | | |
| **Tij g** | 0.3716* | 0.2371* | 0.5468* | | | | |
| **mig_ij** | 0.3537* | 0.1635* | 0.6679* | 0.4506* | | | |
| **mig_ji** | 0.2269* | 0.1634* | 0.2892* | 0.4903* | 0.2321* | | |
| **firms_ij** | 0.5257* | 0.4809* | 0.4244* | 0.4782* | 0.3403* | 0.3403* | |
| **dist_ij** | 0.0273 | 0.0950* | -0.1451* | -0.2197* | -0.1140* | -0.1016* | 0.0951* |

Pairwise correlation. * Correlation significantly different from 0 at 1 %.

Maps in **Figure 3.1 and Figure 3.2** portrait the largest bilateral trade values for 2009 for the sectors of Hostel industry (Accommodation) and Restaurants and the like. There are relevant differences between the main bilateral flows for each sector. **Figure 3.1** showing the main interregional flows in Accommodation, reveal strong relationships between the east-coastal regions and the islands with Madrid. It is important to highlight the importance of the islands as exporters of this kind of flows. The exports from Canarias to

Madrid account for 12% of the overall interregional exports, while the exports from Baleares to Cataluña represent 4.02% and to Madrid 3.98%. This is in line with the hypothesis that for some type of trips whose place of accommodation is is regulated establishments, people look for more distant places. In **Figure 3.2** the main bilateral flows of Restaurants are shown. Contrary to the trade patterns of Accommodation just shown, the main bilateral flows take place between regions with strong relations in terms of stocks of migrants (Andalucía to Cataluña, Extremadura to Madrid, Andalucía to Madrid) or between contiguous regions (some of them also with strong links in terms of crossed population) as the exports from Castilla y León to Madrid, Castilla la Mancha to Madrid, and Castilla y León to Pais Vasco. There are also some large flows that are also related with the strong interregional exports of accommodation as the exports from Canarias to Madrid.

In addition, **Figure 3.3** represents the largest stocks of interregional migration (according to the Spanish Register in 2009). Madrid is also the region with the highest share of population born in other regions. In contrast, an important percentage of people born in Andalucía are people that live in other regions and Andalucía is one of the most important exporters mainly to these regions with important family ties. On the other hand, Baleares is a great exporting region but its inflows are not related with the migration stocks. According to this, although gravity could affect migration for the particular case of Spain, we could say that there are large stocks of migrants between regions that are not located geographically close, as this pattern would rise from economic differences across regions.

**Figure 3.4** shows the most intense relations in terms of potential plant links for the grouping of the three sectors considered as relevant: Accommodation, Restaurants, and Transportation. The graph shows strong linkages between Madrid and Cataluña, both of them with Islas Canarias and Andalucía. In general, strong linkages are shown between the regions with a higher share in the national Gross Domestic Product and some coastal or peripheral regions, i.e., a pure gravity explanation.

**Figure 3.1. Main bilateral flows in €.**
**Accommodation. 2009**
*Units: % of total interregional flows.*

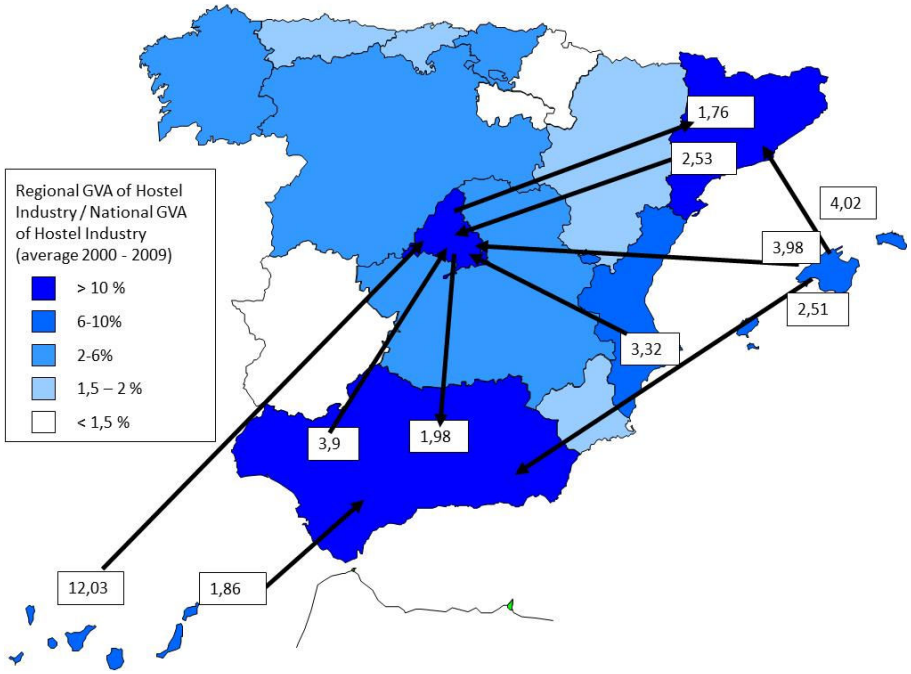



**Figure 3.2. Main bilateral flows in €.**
**Restaurants. 2009**
*Units: % of total interregional flows.*

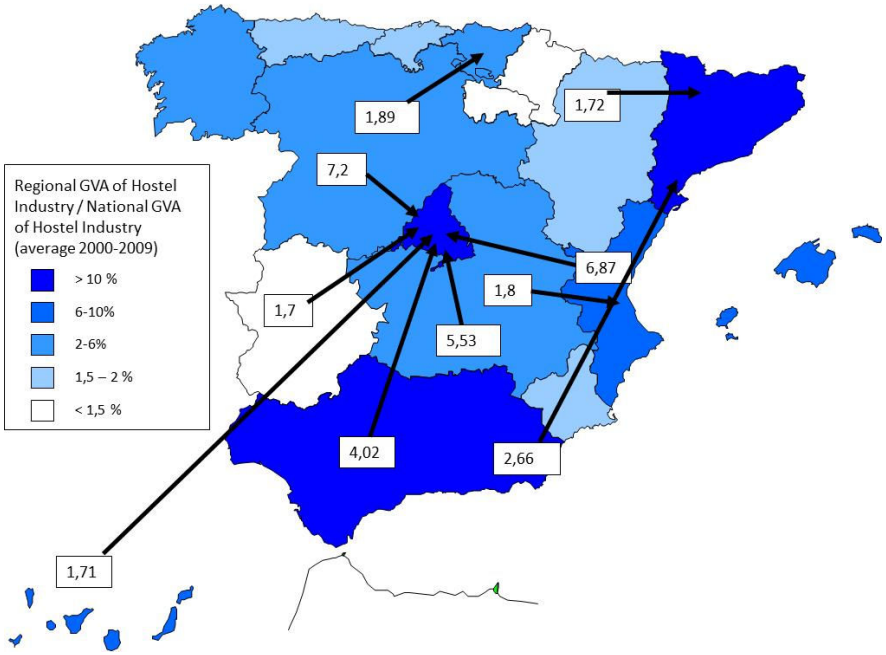


**Figure 3.3. Main bilateral stocks of immigrants. 2009.**
*Units: % of total interregional migration stocks.*

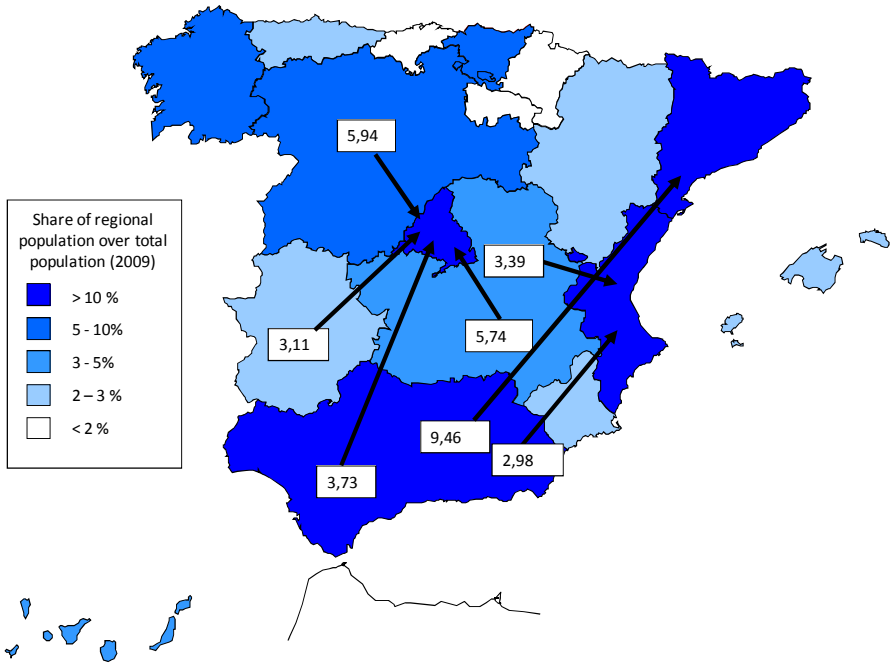
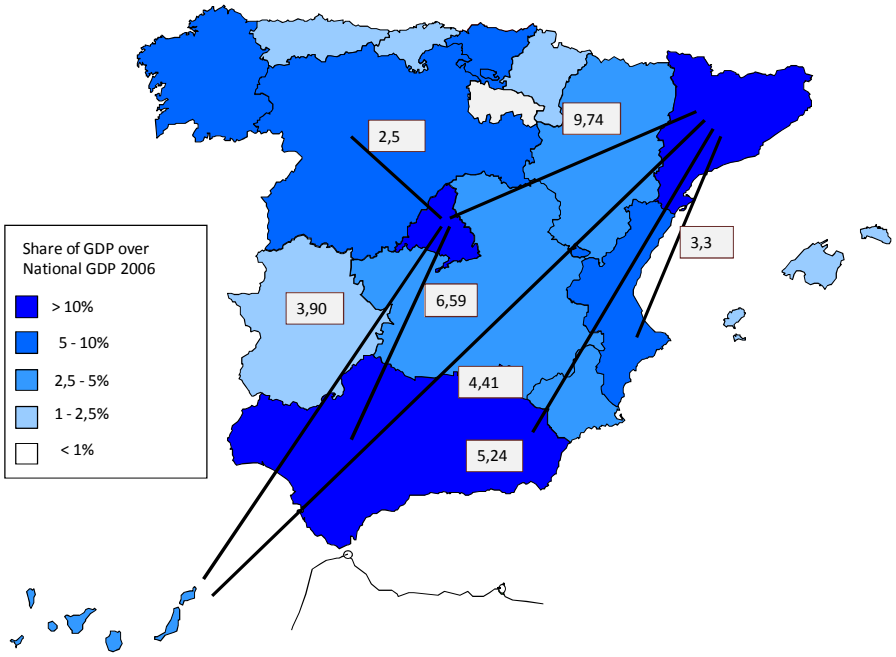



**Figure 3.4. Main potential plant links.**
**Accommodation, Restaurants and Transportation. 2006**
*Units: % of total interregional plant linkages*



## 3.4. Results

### 3.4.1. Econometric analysis

In this section, the results of the estimation of (3) using the Pseudo Poisson Maximum Likelihood procedure described in Santos-Silva and Tenreyro (2006) are shown. Then, to overcome the endogeneity problem explained in the next section we use the instrumental variable version of the Pseudo Poisson Maximum likelihood described in Windmeijer and Santos Silva (1997).

First, the analysis has been done for the aggregate of Accommodation and Restaurants (**Table 3.3**) and then separately for 'Hostel industry-Accommodation' (**Table 3.4**) and 'Restaurants and the like' (**Table 3.5**). Then, the analysis has been replicated for goods in order to make suitable comparisons (**Table 3.6**) and to disentangle to what extent goods and services present different elasticities with respect to the same factors. The immigration and emigration stocks have been included, first separately and then simultaneously, as well as the business network variable. The same structure is followed in each of the four tables. The first column contains the results without network variables, columns (2) thru (4) include migration variables separately and simultaneously, column (5) includes the business network variable without any migration variable. Column (6) reports the effect of migration and business network simultaneously. To test to what extent the results are driven by the period of time considered we have split the sample over 3-year periods. It is found that the estimated coefficients are very stable across the different time periods. The results are not included in the tables, but are available upon request.

**Table 3.3** reports the estimation results for the aggregation of Restaurants and Accommodation. It is important to highlight that a low coefficient for distance is found, becoming non-significant when the migration variables are included. This is an interesting and novel result that is in line with the hypothesis of a heterogeneous impact of distance on trade flows for sectors linked with tourism activity. We can interpret the lack of significance for distance as indicating that after controlling for trips involving people who are not travelling to their home-land, nor visiting the host region where co-nationals are already settled, the friction that distance produces on trade flows is negligible. This result seems consistent with the tendency of population from high income, highly populated regions such as Madrid, travelling to coastal regions for vacation. However, it is also

important to highlight that the coefficient for contiguous regions is positive and significant, signalling that short trips to contiguous regions during the weekends play a role, and that the negative effect of distance is somehow driven by this kind of trips. In addition, the coefficient for contiguity and distance drops in magnitude when the migration variables are included because a share of the interregional migrations takes place between contiguous and close regions. However, as shown in **Figure 3.3** there are large stocks of immigrants from Andalucía to Cataluña or from Extremadura to Madrid, based on the historical differences on per capita incomes across regions, rather than on geographical factors. This pattern of migration flows reduces the gravity in stocks of migration for the case of the Spanish regions. In fact, as shown later this loss of significance in the coefficient of distance when migration is included is not found when we analyze the bilateral trade flows of goods.

**Table 3.3. Results to alternative specification for Accommodation and Restaurants. Estimation method: PPML.**

| Dependent Variable | (1) Tij | (2) Tij | (3) Tij | (4) Tij | (5) Tij | (6) Tij |
|---|---|---|---|---|---|---|
| Ln dist_ij | -0.339** | -0.190 | -0.144 | -0.144 | -0.300** | -0.132 |
| | (0.138) | (0.129) | (0.108) | (0.109) | (0.129) | (0.105) |
| Contig ij | 0.629*** | 0.303** | 0.273** | 0.264* | 0.593*** | 0.237* |
| | (0.158) | (0.152) | (0.139) | (0.136) | (0.144) | (0.132) |
| Ln mig_ij | | 0.349*** | | 0.0477 | | 0.0584 |
| | | (0.0539) | | (0.102) | | (0.107) |
| Ln mig_ji | | | 0.396*** | 0.356*** | | 0.326*** |
| | | | (0.0558) | (0.110) | | (0.109) |
| Ln firms_ij | | | | | 0.103*** | 0.0750** |
| | | | | | (0.0366) | (0.0304) |
| Constant | 13.63*** | 8.417*** | 7.611*** | 7.517*** | 12.83*** | 7.251*** |
| | (0.915) | (1.235) | (1.113) | (1.161) | (0.906) | (1.167) |
| Period | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 |
| Observations | 2,720 | 2,720 | 2,720 | 2,720 | 2,720 | 2,720 |
| R-squared | 0.830 | 0.863 | 0.878 | 0.878 | 0.846 | 0.884 |

Clustered robust standard errors by country pairs in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Origin fixed effects, origin-time fixed effects, destination fixed effects, destination-time fixed effects and time fixed effects are included.

Focusing on the variables of interest, immigration and emigration effects are verified. When both effects are introduced simultaneously just the immigrant effect is verified. In contrast, business network effects are very weak, but still have a positive and significant coefficient.

After analyzing the general characteristics for the aggregate of Hostel industry (Accommodation) and Restaurants, each sector is analyzed separately in order to test to

what extent they have different characteristics and what variables have larger influence on each of them.

In **Table 3.4** the results for the Hostel industry (Accommodation) are reported. First of all, a low negative coefficient for the distance and contiguity variable is found, which turns non-significant when the stock of immigrants is included (although it is still statistically significant when emigrants are included). As in the aggregate of the two sectors, when the two stocks of migrants are included simultaneously, just the stock of immigrants remains significant. This can be explained because when one person travels back to her home town, it could be the case that she owns a second home or a social network defined as relatives or friends favoring that she will go to this region more often because of personal ties, but contemporarily she will spend much less in the sectors that provide goods or services for the non-residents, because they can be provided free of charge by the social network (as explained in the previous section). This is the case of Accommodation where demand will be driven basically by other factors. In contrast, for the Accommodation case, business networks have a positive effect. Although the coefficient obtained is not very high, it is positive and significant in every specification.

**Table 3.4. Results to alternative specification for Accommodation. Estimation method: PPML.**

| Dependent Variable | (1) Tij-h | (2) Tij-h | (3) Tij-h | (4) Tij-h | (5) Tij-h | (6) Tij-h |
|---|---|---|---|---|---|---|
| Ln dist_ij | -0.365** | -0.275* | -0.225 | -0.230* | -0.322** | -0.210 |
| | (0.152) | (0.157) | (0.141) | (0.136) | (0.148) | (0.135) |
| Contig_ij | 0.422*** | 0.273* | 0.219 | 0.239* | 0.375** | 0.204 |
| | (0.163) | (0.161) | (0.151) | (0.145) | (0.146) | (0.140) |
| Ln mig_ij | | 0.176*** | | -0.104 | | -0.0868 |
| | | (0.0676) | | (0.110) | | (0.118) |
| Ln mig_ji | | | 0.245*** | 0.329*** | | 0.292** |
| | | | (0.0739) | (0.122) | | (0.121) |
| Ln firms_ij | | | | | 0.107*** | 0.0905** |
| | | | | | (0.0395) | (0.0360) |
| Constant | 13.27*** | 10.53*** | 9.417*** | 9.703*** | 12.41*** | 9.321*** |
| | (1.008) | (1.545) | (1.511) | (1.469) | (1.067) | (1.503) |
| Period | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 |
| Observations | 2,720 | 2,720 | 2,720 | 2,720 | 2,720 | 2,720 |
| R-squared | 0.828 | 0.843 | 0.857 | 0.857 | 0.840 | 0.862 |

Clustered robust standard errors by country pairs in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Origin fixed effects, origin-time fixed effects, destination fixed effects, destination-time fixed effects and time fixed effects are included.

In **Table 3.5** the results for Restaurants are shown. The strong positive effect of sharing a boundary that appears in the first column is mitigated when migration variables are

included. A similar pattern can be found in the case of the distance coefficient, which becomes non-significant when immigration is included. This is related to the fact that there is a large share of the consumption made in '*Restaurants and the like*' that can be somehow related with the trips to the homeland and contiguous regions, in contrast with what we saw for '*Accommodation'*. This can be easily explained by the fact that most people, when travelling to the region where they were born, incur in expenses in Restaurants and the like as they do in their normal lives. Contrary, they do not consume the accommodation services provided by Hostels, largely oriented for non-residents, because they might own a second home or have relatives that can freely provide accommodation to them. In the case of Restaurants and the like the plant links do not have a statistically significant effect once the stocks of migrants are controlled for.

**Table 3.5. Results to alternative specification for Restaurants and the like. Estimation method: PPML.**

| Dependent Variable | (1) Tij-r | (2) Tij-r | (3) Tij-r | (4) Tij-r | (5) Tij-r | (6) Tij-r |
|---|---|---|---|---|---|---|
| Ln dist_ij | -0.284** | -0.140* | -0.0955 | -0.102 | -0.260** | -0.0976 |
| | (0.124) | (0.0783) | (0.0759) | (0.0714) | (0.116) | (0.0709) |
| Contig_ij | 0.884*** | 0.256* | 0.246* | 0.211 | 0.859*** | 0.204 |
| | (0.158) | (0.148) | (0.136) | (0.137) | (0.155) | (0.137) |
| Ln mig_ij | | 0.579*** | | 0.214** | | 0.214** |
| | | (0.0516) | | (0.101) | | (0.103) |
| Ln mig_ji | | | 0.607*** | 0.417*** | | 0.408*** |
| | | | (0.0496) | (0.112) | | (0.110) |
| Ln firms_ij | | | | | 0.0864** | 0.0317 |
| | | | | | (0.0432) | (0.0246) |
| Constant | 12.34*** | 4.555*** | 3.943*** | 3.687*** | 11.74*** | 3.592*** |
| | (0.820) | (0.853) | (0.808) | (0.832) | (0.758) | (0.842) |
| Period | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 |
| Observations | 2,720 | 2,720 | 2,720 | 2,720 | 2,720 | 2,720 |
| R-squared | 0.845 | 0.926 | 0.936 | 0.937 | 0.857 | 0.938 |

Clustered robust standard errors by country pairs in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Origin fixed effects, origin-time fixed effects, destination fixed effects, destination-time fixed effects and time fixed effects are included.

Finally, in **Table 3.6** a similar analysis has been carried out for trade in goods in order to test to what extent the domestic trade of goods and the services analyzed (Accommodation and Restaurants) tends to be influenced differently by the same factors. Note that the business network variable used here is different from the one used in the analyses done for the services sectors. This variable, has been also kindly provided by Aitor Garmendia, and corresponds to the one used in Garmendia et al. (2012) referring to the sectors included in their database of trade in goods (and also considering that two

firms belong to the same business group if the same shareholder owns 20% of the participation of both firms).

**Table 3.6. Results to alternative specification for trade in goods (goods). Estimation method: PPML.**

| Dependent variable | (1) Tij-g | (2) Tij-g | (3) Tij-g | (4) Tij-g | (5) Tij-g | (6) Tij-g |
|---|---|---|---|---|---|---|
| Ln dist_ij | -0.386*** | -0.308*** | -0.314*** | -0.306*** | -0.349*** | -0.280*** |
| | (0.0861) | (0.0697) | (0.0728) | (0.0699) | (0.0842) | (0.0696) |
| Contig_ij | 0.974*** | 0.679*** | 0.697*** | 0.672*** | 1.045*** | 0.736*** |
| | (0.0931) | (0.0972) | (0.100) | (0.0988) | (0.0851) | (0.0957) |
| Ln mig_ij | | 0.267*** | | 0.214** | | 0.195** |
| | | (0.0466) | | (0.0929) | | (0.0856) |
| Ln mig_ji | | | 0.246*** | 0.0581 | | 0.0672 |
| | | | (0.0452) | (0.0896) | | (0.0825) |
| Ln firms_ij | | | | | 0.250*** | 0.194*** |
| | | | | | (0.0931) | (0.0682) |
| Constant | 16.93*** | 13.29*** | 13.55*** | 13.22*** | 14.62*** | 11.55*** |
| | (0.576) | (0.790) | (0.773) | (0.796) | (0.924) | (0.917) |
| Period | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 |
| Observations | 2,720 | 2,720 | 2,720 | 2,720 | 2,720 | 2,720 |
| R-squared | 0.853 | 0.884 | 0.879 | 0.884 | 0.870 | 0.891 |

Clustered robust standard errors by country pairs in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Origin fixed effects, origin-time fixed effects, destination fixed effects, destination-time fixed effects and time fixed effects are included.

Several differences are found between the results obtained for services and the ones showed in **Table 3.6** for goods. First, the coefficient for distance and contiguity remains significant when the stock of migrants is included. This was not the case for the service flows. Second, although for services it is the stock of immigrants which seems to have a trade creation effect; it is the stock of emigrants which appear to have a positive effect on trade in goods. In the literature has been pointed out that the effect of emigrants (influenced by the taste—preferences—and the information channels) on exports should be higher than the effect of immigrants (influenced only by the information channel). However, in the case of services, as noted before, the effect of this channel can be compensated by the presence of a social network and the provision of some services within the network. Third, it is important to note that the effect of business networks is higher for trade in goods than in services. The coefficient obtained for the plant links is in line with those shown in Garmendia et al. (2012) who obtain a value of 0.31 (including the intraregional flows) and Combes et al. (2005) who obtained 0.23 with a similar specification for domestic trade of goods in France.

Summing up, social networks (friends and relatives) and the ownership of second-homes in the homeland are substituting somehow the service provision of Accommodation; meanwhile Restaurants and the like are positively and highly affected by the fact that family ties attract people that will be potential consumers in this sector. In contrast, the effect of plant linkages is smaller than the one found for trade in goods (0.19) or by Combes et al (2005) for goods (0.23 when it was introduced simultaneously with migration variables, and 0.30 when it was introduced without any other network variable). This can be explained by the fact that the sectors considered in the current analysis are consumer services, so the fact that establishments in different regions belong to the same business groups can drive some part of the demand driven by business trips (representing just 5% of the total trips), or by the fact that tour operators or big business groups that control the supply in this market give some preference to establishments with which they have commercial agreements (i.e., business networks). The share of the demand related to this fact is quite small (higher in Hostel industry-Accommodation). In contrast, there is a huge part of the trade in goods that it is related with intra-firm trade. As a consequence, a higher coefficient for the business connections in producer services trade is expected.

### 3.4.2. Endogeneity issues

The analysis presented could have some endogeneity problems induced by reverse causality on the variables of interest: immigrants and emigrants stocks and plant links. On the one hand, regarding the variables of social networks (immigration), if a region is a great exporter of services, this will increase its gross domestic product and then, a higher number of people will have an economic incentive to move to this region, but also large flows in services linked to tourism may mean that this region is very attractive to people, and therefore , people could choose this region as a destination for her trips—and also at some point of her life cycle, she could eventually decide to move there, triggering migration, e.g. retirement. On the other hand, regarding the business network variable, a similar mechanism will arise. If a region has large exports, then when a firm decides to set a new branch in any other region, it will have incentives to locate in those regions that are capable of attracting a lot of people and where the expected profit will be larger.

This problem has been solved in two ways. First, the trade variable is a yearly flow while social and business networks are stocks of migrants and plants located in the region at a

given point on time. This should reduce the simultaneity and the reverse causality issues. Secondly, the analysis has been done again using the instrumental variable version of the Pseudo Poisson Maximum likelihood described in Windmeijer and Santos Silva (1997). In the literature, the endogeneity of the stock of migrants has been treated using an instrumental variables approach with the lagged dependent variable as instrument. From the best of my knowledge there is not any reference tackling the endogeneity problem in business networks. This is explained because there is less references analyzing the business network effect on trade, but also because it is very difficult to find a valid instrument. In fact, in Combes et al. (2005) it is recognized that this problem could arise for business networks, but that a good instrument was not found. As in previous analyses the stock of immigrants and emigrants of a year prior to the sample period will be used as instruments. In this case, the stock of migrants given by the Spanish Census in 1981 (INE) has been used. Then, for the case of business networks, as the variable has been constructing using data for 2006, the reverse causality issue does not apply if we restrict the analysis to the period 2007 to 2009.

In the future, at least two additional strategies regarding the endogeneity in business networks will be followed. Firstly, the instrumental variables approach will be used using as an instrument the number of branch locations of each *saving bank* by region in respect to the region where the headquarters are located. This variable might be a valid instrument for the migration variables, since savings banks have a social aim linked with their local communities whose purpose is to increase social welfare (corporate social responsibility), and therefore they might tend to locate in regions where a large amount of emigrants live. This might be also related with plant links in any other sectors. Secondly, an additional approach in order to solve the endogeneity problem relies on using the propensity score matching technique. Chen and Mattoo (2008) analyzed the effect of a harmonization in standards on trade between the countries in a free trade agreement and the effect on third countries. In passing they explained that this technique is used to create the missing counterfactual of a harmonized industry, and then, matched each harmonized industry with an unharmonized industry which exhibits very similar characteristics. Finally, the causal effect of harmonization was derived from the average difference in the growth of trade between each harmonized industry and its matched control industry. They found that trade in harmonized industries grows significantly faster after harmonization than in unharmonized industries that share similar characteristics, while obtaining comparable results to those obtained with the instrumental variables approach.

The advantage of using the propensity score matching is that the discussion about whether the instrument is valid or not could be avoided. However, we will need to have an adequate amount of number of regions that do not received the necessary treatment (i.e. do not have business networks) in order to make possible to find a counterfactual for those regions that receive the treatment (i.e., do have plant links). That is, the group overlap must be substantial. In addition, we should be confident that everything else is being controlled for, since if it is not, a bias could appear as a result of matching controls for the observed variables. (Shadish et al., 2002).

In **Table 3.7-Table 3.10** the results using the IV version of the PPML are reported. In **Table 3.7** the coefficients estimated for the aggregate of Accommodation and Restaurants are shown. In **Table 3.8** and **Table 3.9** the results are presented separately for Accommodation and Restaurants. Finally**, Table 3.9** contains the results for trade in goods. In general, the results for the variables of interest are very similar to the ones obtained without using the instrumental variables approach, so the estimation of the variable of interest seems to be robust to the potential problem of endogeneity.

**Table 3.7. Results to alternative specification for Accommodation and Restaurants. Estimation method: IVPPML.**

| Dependent Variable | (1) Tij | (2) Tij | (3) Tij | (4) Tij | (5) Tij |
|---|---|---|---|---|---|
| Ln dist_ij | -0.194*** | -0.136*** | -0.136*** | -0.125*** | -0.108 |
| | (-0.04) | (-0.04) | (-0.04) | (-0.04) | (-0.06) |
| Contig_ij | 0.306*** | 0.252*** | 0.255*** | 0.229*** | 0.306*** |
| | (-0.05) | (-0.05) | (-0.05) | (-0.05) | (-0.08) |
| Ln mig_ij | 0.344*** | | -0.012 | 0.003 | 0.044 |
| | (-0.02) | | (-0.04) | (-0.04) | (-0.08) |
| Ln mig_ji | | 0.416*** | 0.426*** | 0.392*** | 0.336*** |
| | | (-0.02) | (-0.05) | (-0.05 | (-0.08) |
| Ln firms_ij | | | | 0.073*** | 0.063*** |
| | | | | (-0.01) | (-0.02) |
| Constant | 8.728*** | 7.559*** | 7.587*** | 7.335*** | 8.005*** |
| | (-0.43) | (-0.44) | (-0.43) | (-0.43) | (-0.75) |
| Period | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2007-2009 |
| Observations | 2720 | 2720 | 2720 | 2720 | 816 |
| R-squared | 0.857 | 0.872 | 0.872 | 0.878 | 0.889 |

**Table 3.8. Results to alternative specification for Accommodation. Estimation method: IVPPML.**

| Dependent Variable | (1) Tij-h | (2) Tij-h | (3) Tij-h | (4) Tij-h | (5) Tij-h |
|---|---|---|---|---|---|
| Ln dist_ij | -0.279*** | -0.195*** | -0.208*** | -0.191*** | -0.156 |
| | (-0.05) | (-0.05) | (-0.05) | (-0.05) | (-0.08) |
| Contig_ij | 0.272*** | 0.165** | 0.216*** | 0.182*** | 0.298*** |
| | (-0.06) | (-0.06) | (-0.05) | (-0.05) | (-0.08) |
| Ln mig_ij | 0.174*** | | -0.238*** | -0.216*** | -0.206* |
| | (-0.02) | | (-0.05) | (-0.05) | (-0.09) |
| Ln mig_ji | | 0.304*** | 0.489*** | 0.448*** | 0.411*** |
| | | (-0.03) | (-0.06) | (-0.06) | (-0.1) |
| Ln firms_ij | | | | 0.085*** | 0.069*** |
| | | | | (-0.01) | (-0.02) |
| Constant | 10.933*** | 8.857*** | 9.619*** | 9.266*** | 10.133*** |
| | (-0.53) | (-0.61) | (-0.54) | (-0.54) | (-0.93) |
| Period | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2007-2009 |
| Observations | 2720 | 2720 | 2720 | 2720 | 816 |
| R-squared | 0.836 | 0.853 | 0.849 | 0.854 | 0.865 |

**Table 3.9. Results to alternative specification for Restaurants and the like. Estimation method: IVPPML.**

| Dependent variable | (1) Tij-r | (2) Tij-r | (3) Tij-r | (4) Tij-r | (5) Tij-r |
|---|---|---|---|---|---|
| Ln dist_ij | -0.144*** | -0.105*** | -0.113*** | -0.108*** | -0.111* |
| | (-0.03) | (-0.03) | (-0.03) | (-0.03) | (-0.05) |
| Contig_ij | 0.275*** | 0.280*** | 0.234*** | 0.226*** | 0.257** |
| | (-0.05) | (-0.05) | (-0.05) | (-0.05 | (-0.09) |
| Ln mig_ij | 0.561*** | | 0.274*** | 0.275*** | 0.328*** |
| | (-0.02) | | (-0.04) | (-0.04) | (-0.08) |
| Ln mig_ji | | 0.574*** | 0.333*** | 0.323*** | 0.268** |
| | | (-0.02) | (-0.04) | (-0.04) | (-0.08) |
| Ln firms_ij | | | | 0.035*** | 0.038* |
| | | | | (-0.01) | (-0.02) |
| Constant | 4.730*** | 4.377*** | 4.012*** | 3.899*** | 4.334*** |
| | (-0.33) | (-0.31) | (-0.32) | (-0.33) | (-0.61) |
| Period | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2007-2009 |
| Observations | 2720 | 2720 | 2720 | 2720 | 816 |
| R-squared | 0.914 | 0.924 | 0.926 | 0.927 | 0.926 |

**Table 3.10. Results to alternative specification for trade in Goods. Estimation method: IVPPML.**

| Dependent variable | (1) Tij-g | (2) Tij-g | (3) Tij-g | (4) Tij-g | (5) Tij-g |
|---|---|---|---|---|---|
| Ln dist_ij | -0.303*** | -0.312*** | -0.302*** | -0.276*** | -0.246*** |
| | (-0.03) | (-0.03) | (-0.03) | (-0.03) | (-0.05) |
| Contig_ij | 0.665*** | 0.696*** | 0.663*** | 0.720*** | 0.713*** |
| | (-0.04) | (-0.04) | (-0.04) | (-0.04) | (-0.06) |
| Ln mig_ij | 0.281*** | | 0.265*** | 0.251*** | 0.202** |
| | (-0.02) | | (-0.04) | (-0.04) | (-0.07) |
| Ln mig_ji | | 0.248*** | 0.018 | 0.025 | 0.089 |
| | | (-0.02) | (-0.04) | (-0.04) | (-0.07) |
| Ln firms_ij | | | | 0.187*** | 0.160** |
| | | | | (-0.03) | (-0.05) |
| Constant | 6.410*** | 6.833*** | 6.385*** | 4.736*** | 4.999*** |
| | (-0.3) | (-0.29) | (-0.3) | (-0.36) | (-0.62) |
| Period | 2000-2009 | 2000-2009 | 2000-2009 | 2000-2009 | 2007-2009 |
| Observations | 2720 | 2720 | 2720 | 2720 | 816 |
| R-squared | 0.871 | 0.866 | 0.871 | 0.877 | 0.862 |

In all the cases, clustered robust standard errors by country pairs in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Origin fixed effects, destination fixed effects, and time fixed effects are included.

## 3.5. Conclusions

We have studied the determinants of interregional trade flows on services from a gravity perspective that includes distance, social networks produced by the stock of interregional migration in each region, and firms' links. Additionally, the results have been compared to those obtained for trade flows of goods. The motivation for this analysis is threefold: first, it is well known that in all the developed countries, services account for the largest part of all economic activity; second, due to the lack of information on bilateral trade in services, it is difficult to find empirical studied on this subject. Therefore, the relation between trade of services, distance, and the presence of informal barriers remains an open question. However, given the characteristics of services (intangibility, inseparability, heterogeneity, difficulty of evaluation….) the importance of tastes and the reduction on information costs are be expected to play a major role than in goods. However, there is an additional force that could apply for the case of some services, as the Hostel industry (Accommodation), and it is the fact that social networks may be provide some services instead of firms. A third motivation is that due to data restrictions, most studies have focused on the link between international migration and international trade, not taking into consideration that the bulk of people and trade flows is between regions within countries. This is also related with the previous comment, because not always a large number of tourists or trips have economic consequences at least in some sectors of the region. In parallel with the positive relation between trade in goods and networks, it is reasonable to expect that social and business networks also foster trade in services.

From the theoretical point of view, we make use of previous references that embed the interregional trade flows in the well-known Dixit–Stiglitz–Krugman framework, including the role of social and business networks through transaction costs. The novelty of our application resides on the unique dataset that has been compiled on the interregional trade flows of two important service sectors linked to the tourist activity, which includes *Accommodation* and *Restaurants* for the period 2000–2009 (see www.c-intereg.es).

Results show a low negative effect for the distance and a positive effect on sharing a boundary. The results obtained have confirmed that once we control for the social networks, the effect of distance disappears, being consistent with the idea that the presence of a social network in the homelands and the personal ties that it generates could mitigate the effect of distance on the flows of services (which nevertheless is still present

in the bilateral flows to and from contiguous regions). This result could also be interpreted as a consequence of the gravity in migration, but it is a result that does not appear when trade flows of goods are analyzed.

We have also found an important positive effect on the network variables that reduces once they are included simultaneously. Results differ when we analyze each sector separately in such a way that we find evidence in favor of a positive effect for the emigration and immigration variables in the Restaurants sector. That shows that the potential gains of trade from migration linkages in Accommodation are limited (even disappear) by the high presence of second-homes and the free provision of accommodation, by the social network (relatives, friends, second-homes….). However, those trips of people result in a higher consumption in Restaurants. Regarding plant linkages a small effect is found, although it is bigger for the case of Accommodation. In any case, the effect is residual in comparison with the effect found for trade in goods. Results are consistent when the potential endogeneity is treated with the instrumental variable version of the Pseudo Poisson estimator.

We expect that these results vary for the rest of the services, according to the characteristics of each industry, remarking the need to analyze each service separately and not at the aggregate. Including transport costs measures or travel times will also improve the analysis by making it possible to analyze the effect of public investment in infrastructure in terms of regional integration and competitiveness. For future research it will also be interesting to analyze to what extent this results differ not just across sectors but also considering the type of accommodation where the overnight takes place.

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## 3.7. Appendix: The theoretical model

This section is based on Combes et al. (2005), who developed a model of monopolistic competition a la Dixit–Stiglitz–Krugman, which accounts for home bias in the consumer's preferences and transaction costs.

The DSK framework offers several advantages compared to others available in the literature of international trade: first, as shown by different authors, this model offers a robust theoretical base for deducing the gravity model, and therefore, for the empirical analysis of the intensity of flows between dyads of countries or regions; second, the monopolistic competition model is based on some theoretical assumptions that fit especially well with the tourist sector, such as the presence of a large market with free-entry conditions and a number of companies offering a large variety of services (hotels and restaurants with different qualities, cultural and environmental characteristics), with some capacity to fix monopoly prices and benefit from a certain monopolistic situation, mainly when the tourist has arrived at the destination and any variation in the tourist plan is costly.

The representative consumer's utility in region *i* depends upon the consumption $T_{ijth}$ of all varieties *h* of services produced in any region *j* at a moment *t*. Varieties are differentiated with a constant elasticity of substitution (CES). Each variety imported from region *j* is weighted by a coefficient $a_{ijt}$, which describes the preferences of consumers from *i* with respect to varieties from *j* at time *t*. Let $n_{jt}$ denote the size of the supply in region *j,* and *N* the total number of regions. Thus the corresponding utility function in a moment of time *t* is

$$\mathrm{U_{it}} = \left( \sum_{j=1}^{N} \sum_{h=1}^{nj} (\mathrm{a_{ijt}} T_{\mathrm{ijth}})^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \tag{4}$$

where σ > 1 is the elasticity of substitution. If $p_{ij}$ is the price of the service that has to be paid by any resident in region *i* for services from *j*, which includes the service consumed in the destination region, the cost of travel or the information cost, then, the transaction costs are represented in the price differences between locations, $p_{ijt} = (1+\tau_{ijt})\, p_{jt}$, where $\tau_{ij}$ is the iceberg-type cost of travelling from regions *i* to *j* and $p_j$ the mill price in region *j*. Thus, the demand function of region *i* for touristic services offered by region *j* is described by

$$T_{ijt} = T_{it} P_{it}^{\sigma} n_{jt} p_{jt}^{-\sigma} a_{ijt}^{\sigma-1} (1+\tau_{ijt})^{-\sigma} \tag{5}$$

where $T_{it} = \sum\sum T_{ijth}$ is the total consumption (in quantities, i.e., number of nights in hotels, number of meals in restaurants,…) of the residents in region *i* of the differentiated varieties of services imported from all possible regions, and where $P_{it}$ is the price index in region *i*,

$$P_i \equiv \left( \sum_j a_{ijt}^{\sigma-1} n_{jt} p_{ijt}^{1-\sigma} \right)^{1/(1-\sigma)} \tag{6}$$

As in Combes et al. (2005) transaction costs include two different elements. On the one hand, physical transport costs, $TC_{ij}$, that will be approximated by the distance and consequently will be constant. On the other hand, the information costs $I_{ijt}$. Transaction costs are modeled as follows:

$$1+\tau_{ijt} = TC_{ij} I_{ijt} \tag{7}$$

where $TC_{ij} \geq 1$ is a measure of transport cost between *i* and *j* and is a function of distance. For the case of tourism the best option would be to consider also the relation between the distance and the transport mode used for the trip. In the case of international or interregional tourists in a large country, the mode choice may break the linear relation between distance and transport cost. However, the assumption of a linear function is more plausible for the interregional trips in a small country like Spain, with a prevalence of land transportation (often in private vehicles) and a less dispersed transport cost for those modes competing for short distance trips. For the information cost it is assumed:

$$I_{ijt} = (1+mig_{ijt})^{-\alpha_I} (1+mig_{ijt})^{-\beta_I} (1+firms_{ij})^{-\gamma_I} \exp(-\psi_I Cont_{ij}) \tag{8}$$

where $Cont_{ij}$ is a dummy variable set to 1 when *i* and *j* are contiguous regions and $\psi_I > 0$, that is, the informational transaction cost is higher between two distant regions than between neighboring ones. The direct impact of social networks on information costs is captured by two variables, $mig_{ijt}$ and $mig_{jit}$, corresponding to migrant networks. The imports of residents in *i* from touristic services of region *j* (tourists moving from *i* to *j*), could be positively correlated with the number of people born in region *i* living in region *j* (therefore, $mig_{ij}$ captures the "emigrants" effect). Reciprocally, the imports of residents in *i* of tourist services of *j* (tourists moving from *i* to *j*), could be positively correlated with the number of people born in region *j* living in region *i* (therefore, $mig_{ji}$ captures the "immigrants" effect). Since migrants and plant networks are assumed to reduce information costs of trade shipments going in both directions, parameters $\alpha_I, \beta_I, \gamma_I$ are expected to be positive.

Consumers are assumed to have both deterministic and stochastic elements in their preferences $a_{ijt}$ (eq. (9)). For the deterministic part it is assumed that it is more likely that individuals consume services from contiguous regions and from their homeland region[17]. Then, immigration affects trade, both through preferences and information channels. Finally, $e_{ijt}$ is the random component of the preferences.

$$a_{ijt} = (1 + mig_{ijt})^{\alpha_a} \exp(e_{ijt} + \psi_a Cont_{ij}) \quad (9)$$

[17] Intraregional flows are not included for simplicity, given that they are not including in the empirical analysis. They can be included as a factor that reduces information costs and being part of the preferences in line with the strong border effects found for trade in services.

# 4.Social networks and trade of services: modelling interregional flows with spatial and network autocorrelation effects

## 4.1. Introduction

In spite of decreases in transportation costs, recent literature on the border effect shows how countries still engage more in internal trade within regions than external trade with other countries (McCallum, 1995; Helliwell, 1996; Wolf, 2000; Chen, 2004; Okubo, 2004; Evans, 2006). In an effort to explain this, research has increasingly focused on informal barriers to trade. One such barrier is a lack of information that hampers international trade and investment opportunities (Rauch and Casella, 2003). Social and business networks are seen as possible channels to overcome such barriers and increase the volume of international trade (Portes and Rey, 2005). Evidence supporting such channels has been found for business groups operating across national borders (Belderbos and

Sleuwaegen, 1998), immigrants (Gould, 1994), and long-settled ethnic minorities that maintain co-ethnic business societies.

This literature distinguishes two main mechanisms through which bilateral trade could be promoted by immigration. The first mechanism is related to 'idiosyncratic' preferences of immigrants or 'taste effects', where the positive impact of immigrants on trade intensity reflects tastes for goods (willingness to pay) from their countries of origin. The second mechanism is the reduction of transaction costs or 'information effects', since immigration reduces transaction costs since migrants are familiar with preferences, social institutions, language and legal institutions of both countries, which reduces communication costs and cultural barriers. Moreover, communication between immigrants and those living in their country of origin is facilitated by social and business networks, which are thought to be the explanation for higher levels of bilateral trade flows. Helliwell (1997) argued that given that institutions might be more different across countries than between regions within the same country, the trade creation effect of migrants should be bigger on international than on interregional trade. However, several papers (Combes et al., 2005; Millimet and Osang, 2007; Garmendia et al., 2012) have found that even at the regional level, the presence of networks can explain a part of the border effect puzzle. In fact, given that a higher percentage of both migration and trade takes place between regions within the same country, we could expect that this effect will be greater in absolute terms for domestic than for international trade.

Motivated by this literature, we investigate whether similar results exist for regional trade in services. We focus on the special case of interregional trade flows of some sectors related with tourism: Accommodation, Restaurants and Travel Agencies. Trade in these sectors usually implies a cross-border movement of people. The motivation for this focus is fourfold: first, it is well known that in all developed countries, services account for the largest part of the economic activity; second, due to the lack of information on bilateral trade of services, it is difficult to find empirical work quantifying border effects for services. Therefore, the relation between distance, the trade of services and the presence of informal barriers remains an open question. Third, we can expect that given the characteristics of services, information and tastes should have a larger influence on their trade than for the case of goods. And finally, due to data restrictions, most studies have focused on the link between international migration and international trade, not taking into consideration that the bulk of people and trade flows takes place between regions within countries.

Focusing on the link between tourism and migration at the international level, the

network effects in absolute terms could be reduced by the limited number of foreign immigrants in a country given the legal and practical restrictions to migrate, the low-income composition of the immigration structure, and the high cost of travel back to the home country. However, when the analysis focuses on the internal or interregional tourism flows, we might expect to see higher magnitudes of flows. According to a recent report by the World Bank (The World Bank, 2008), the largest migration movements in the world are taking place nowadays within countries rather than between countries. According to this report, while 500,000 Chinese emigrated abroad in 2005, more than 150 million people moved internally in China itself. Similarly, in Brazil during the 1960s and 1970s, almost 40 million people left the countryside for cities. However, this huge displacements are not just observed in developing countries were mass rural exodus are on course, but in OECD countries as well. For example, in the US cumulative moves over the five year period from 1995 and 2000 involved 112 million people for the United States, of which 22 million involved moves between states (Perry and Schachter, 2003). Spain is a much smaller country, but with a strong tourist tradition, since Spain ranks 3rd in the World in terms of international tourists inflows, and with a large tradition of internal movements during holydays and weekends. In 2001, there were 552 million overnight stays by Spanish citizens within Spain, despite the fact that Spain has only 42 million citizens. In addition, mobility of Spanish citizens is such that 16% of the population live in a region different from that in which they were born. An important distinction between interregional and international movement of citizens is that lodging expenses may be lowered by ownership of 'second residences, e.g., beach condominiums' or the ability to 'share' accommodations with relatives and friends in the case of interregional flows of visitors, augmenting potential savings on 'transaction costs' induced by the presence of 'social networks' that would apply in the case of international tourism flows.

Despite these intuitively appealing reasons leading to believe that the potential for significant relationships between trade flows in sectors linked with tourism and stocks of immigrants in the interregional case is greater than for international tourism, the lack of information has limited the ability to explore this type of interregional flows. To our knowledge there have been no previous attempts to measure this type of relation for internal flows in service sectors linked with the touristic activity in Spain or worldwide[18]. In terms of social networks there are several mechanisms that could induce positive correlation between trade and the intensity of the demographic linkages. In addition to the

[18] There are some studies analyzing internal tourism flows, but they use input-output models (Eriksen and Ahmt, 1999), or time series approaches (Athanasopoulus and Hyndman, 2008); none adopt a gravity model with cross-sectional data, nor they pay attention to network effects.

traditional trade creation effect of emigrants and immigrants found in the literature we find that there are also potential sources of cross-section autocorrelation based on the regional concentration of the stocks of interregional emigration and immigration. This source of cross-section autocorrelation that we have labelled as 'network autocorrelation' or 'demographic-based autocorrelation', could also affect the bilateral flows between two regions. These channels will be explained in Section 2[19].

Recently, several articles have made use of spatial econometrics techniques when analysing different topics in international economics such as the determinants of Foreign Direct Investment or the effects of entering in a bilateral agreement. This fact has highlighted the importance of including the geographical perspective in the analyses in order to control for the spatial dependence caused by spatial aggregation, spatial externalities, spillover effects and the spatial heterogeneity (Anselin, 1988). Porojan (2001) revisited the gravity model of trade using the increasingly acknowledged findings of spatial econometrics. He examined the effect of being a member of a Regional Trade Agreement incorporating the spatial effects in the analysis. He found that substantial changes occur in the magnitude and the statistical significance of the estimated parameters when the interdependence among countries is controlled. More recently, Egger and Larch (2008) examined the determinants of entering in a bilateral Preferential Trade Agreement (PTA) making use of techniques drawn from spatial econometrics. They employ models for discrete choice panel data and a Bayesian spatial discrete choice model for interdependent cross-sectional data, paying attention on the interdependence of PTA memberships. Ledyaeva (2009) analysed empirically the determinants of the FDI in the Russian regions. This paper showed how adjacent regions have influenced FDI inflows to a particular region using a lag-dependent variable and the market potential. Finally, Behrens et al. (2012) derived a structural gravity equation system in which both trade flows and error terms are cross-sectionally correlated that can be estimated using techniques from the spatial econometrics literature. According to their findings controlling directly for cross-sectional interdependence reduce measured border effects by capturing 'multilateral resistance' that is not totally controlled using origin and destination specific fixed effects.

Based on these recent approaches, in this paper we study the relation between interregional trade flows of services linked to the tourism sector using a gravity model

[19] In previous versions, we described as 'direct effects' the trade creation effect of social networks that has been traditionally described in the literature and as 'indirect of effect' the spatial autocorrelation of the flows (based on the demographic structure). In this version, we have abandoned these concepts in order to be more consistent with the terms used in the spatial econometrics literature and in the trade literature.

that relies on conventional distance measures thought to inhibit flows, plus spatial econometric methods for incorporating social network relationships between regions into the gravity model. The latter are based on use of the stock of interregional immigrants living in each region to form a spatial weight structure linking regions. This type of interregional dependence is contrasted with more conventional weight structures based on the geographical proximity of regions. We exploit recent estimates of the intra and interregional trade flows of services sectors linked with tourism activity between Spanish regions for the period 2000-2009 (de la Mata and Llano, 2012), as well as efficient Bayesian econometric approaches based on Markov Chain Monte Carlo (MCMC) estimation methods. Such methods are used for two alternative spatial model specifications, namely, a spatial lag model (SAR) and a general spatial model (SAC). Both specifications have been defined in such a way that embed two different weight matrices, which attempt to capture –independently and simultaneously- the two complementary autocorrelation effects described before, spatial and demographic.

We show that in the case of a simple gravity model, a strong 'internal border effects' exists, and trade of services linked with the tourism sector responds with a small negative but significant response to distance while controlling for intra-regional trade flows. More sophisticated models that introduce an increasing number of autocorrelation effects tend to diminish the importance and significance played by geographical distance in the simpler models. These results are interpreted as an indication that people in their domestic trips express a preference for consumption of services from regions with which they have strong migration linkages. Spatial econometric methods draw upon the concept of 'neighbouring regions', where this is typically measured using geographical proximity. We broaden this concept to include regions that could be considered 'neighbours' based on the structure of emigration and immigration for each region. The role played by this type of regional connectivity could be labelled 'network effects', since past migration flows in conjunction with social networks represent an alternative to conventional geographical proximity of regions.

An interesting finding is that after taking into account conventional geographical proximity and network connectivity of regions, the role played by distance between exporting and importing regions drops. This means that the presence of social networks reduces the frictions that distance introduces. This result is in line with the ones obtained in previous chapters, although the comparability between them is not complete due to several differences on the scope and the specifications of the models.

In Section 2 we discuss some aspects of trade on services as well as network influences on

trade flows of services. Section 3 presents an empirical gravity model, detailing a series of increasingly complex specifications that control for spatial/geographical as well as network dependencies. Empirical results obtained from applying the model to intra-and inter-regional trade flows associated with tourism in Spain are presented and discussed in section 4.

## 4.2. Trade and social networks: background and definitions.

### 4.2.1. Previous literature

An economic network has been defined as a group of agents that pursue repeated, enduring, exchange relations with one another (Podolny and Page, 1998). Based on this definition, several authors have analysed the impact on bilateral trade between origin and destination regions of the stock of immigrants or emigrants from/to the importing and exporting region. As Rauch (2001) pointed out in his review, an immediate concern is that any positive impact of immigration on trade may simply reflects immigrant preferences for goods from their countries of origin, or a correlation of immigration with country of origin or destination characteristics that promote trade, for example geographic proximity. However, different authors have demonstrated that apart from these 'taste effects', there are also 'network effects' induced by the social linkages that immigrants maintain with their countries of origin. Such linkages may lead to important reductions in transaction cost resulting in increased bilateral trade flows.

Some authors have tried to quantify the relevance of social and business networks on trade in goods between countries. For example, Gould (1994), in an early article analysed US trade with 47 other countries over the period from 1970 to 1986, arguing that immigration reduced information costs and or resistance due to border-effects. Head and Ries (1998) carried out a similar analysis of Canadian bilateral trade involving 136 countries for the period 1980 to 1992. Dunlevy and Hutchinson (1999; 2001) studied US imports and exports over the period from 1870 to 1910, finding that immigration affected both imports and exports. They argue that for the case of imports 'taste effects' are larger than what they term 'information effects'. For exports they contend that 'information effects' are more important because this facilitates knowledge needed to promote trade

opportunities between both countries. Similarly, Wagner et al. (2002) studied the effects of immigration on the international trade of Canadian provinces, and Rauch and Trindade (2002) studied how the presence of Chinese ethnics affect bilateral trade. In countries where a large presence of Chinese ethnics who maintained connections with their home land, as in southeast Asia, the effects on the bilateral trade were found to be greater. Digging deeper into the historical causes of the social networks induced by stocks of immigrants, Girma and Yu (2002) carried out an analysis using data on immigration and trade for the United Kingdom. They distinguished between migration from countries with historical relations to the Commonwealth and countries with no such relation. White and Tadesse (2008) measured the effect of immigration on trade, using state-level US data, 75 countries, and a novel indicator of cultural distance. They too confirmed that immigrants tend to counteract the negative effect on trade arising from cultural distance. However, their results indicated that the influence of immigrants on trade was not large enough to overcome resistance to trade associated with information costs induced by cultural distance or separation.

The role played by migration in determining patterns of trade flows within a single country has been examined by a reduced number of papers. Helliwell (1997) analysed the interregional and international trade of Canada and the US, finding that interregional migration played a minor role compared to that of international migration. The argument was that 'taste and information effects' are smaller between regions than between countries because differences in institutions are smaller. More recently, Combes et al. (2005) quantified the impact of social and business networks on the intensity of interregional trade between 94 French regions (departments). Using different gravity models, they verified that despite of the traditional impediments to trade (distance and boundaries), networks facilitate bilateral trade, finding larger effects for business than for social networks. Finally, for the Spanish case, Garmendia et al. (2012) found out that the large border effect for the domestic Spanish trade disappear once the difference in social and business networks within regions and between regions (higher in the former) is considered.

As already noted, most of these studies focus on trade of goods, without considering interregional trade of services and the role played by interregional migration flows. To this regard, although the results found by Helliwel (1997) and others may point out to a less relevant effect of migration on trade of goods within a country than between countries (due to the lower differences within countries in terms of flavours, culture, institutions, etc), there are also several reasons to expect larger effects when dealing with services:

first, the magnitude of domestic trade in services is much larger than goods in all OCDE countries[20]; second, within countries immigration flows could be very intense, and some times larger and more persistent over time than between countries; third, considering that information is more important for trade in services than for trade in goods (in relation with the 'face-to-face relation', also called the 'proximity burden'), the effect of a reduction in transaction costs driven by the presence of social networks is expected to be larger; finally, as we have commented above, when focussing on interregional trade flows of services related to the tourism sector, one must consider that apart from the information and taste effects operating in goods, there is a potential reduction of lodging costs for those tourists that take advantage of second homes and accommodations owned by relatives and friends, a case that is more likely to occur within countries, when traveling back to the regions where they were born. Note that at least in some Mediterranean countries like Spain, Italy ore France, this phenomenon is far from sporadic, and may be repeated almost every weekend.

### 4.2.2. Relations between flows linked with tourism and migration

For generality and simplicity, in this section we describe concepts related to both international and interregional trade and the role of past migration flows embodied in stocks of migrants from various origins. This approach might be more appealing to an international audience, despite the fact that our empirical application uses interregional data. More specifically, in our empirical application, we will just consider interregional trade and migration flows between the 17 Spanish regions (NUTS2).

For our purposes, an immigrant is defined as an individual who was born in a different region ('home-land') from his current region of residence ('host region'). Note also that, when considering interregional monetary flows of sectors linked to touristic activity, an 'exporting region' is the one producing the service, in our case the region receiving the tourists. Focusing on these sectors, there are several channels that may lead to a positive relationship between the intensity of trade and the presence of social networks. We classify these channels in two groups to differentiate between relations affecting the trading regions ('*emigrants and immigrants effects*', as has been traditionally labelled in the literature), or relations affecting neighbours of the trading regions (cross section

[20] For example, according to the Spanish National Accounts, more than 60% of the Spanish GDP is produced by services, and more than 70% of the total output is consumed within the country.

autocorrelation).

Before going deeper in explaining the emigrants and immigrants effect on trade in services, it is useful to show that regarding trade on services, the movement of people (when we are talking on trade on services in mode 2) and the trade flow go in opposite directions. As an example, when one person travels from region *j* to region *i*, and this person consumes services in region *i*, it will be a service provision of firms in regions *i* to a resident in region *j*; that is, an export of services from *i* to *j*. Then, the origin of the monetary flow (export) corresponds with destination of the trip and vice versa.

Related to the channels considered in the empirical literature on the trade creation effect of social networks, two main ways can be described connecting our trade flows linked to tourism and the interregional migration stocks:

1. The destination choice of an internal touristic trip by immigrants is conditioned by family ties with their homeland. Since tourists take advantage of vacations to visit their homeland, they may own homes or have access to real state in these regions. Then, the larger the stock of emigrants in a region, the larger the exports from the regions of origin of the immigrants (region where they were born) to the host regions. We label this as '*emigrants effect*'.

2. Conversely, relatives and friends (that have not migrated and still reside in the homeland) may tend to visit immigrants in the host region, since these visits are made easier by access to information and less expensive dwelling options than other possible tourism destinations. Then, the larger the stock of immigrants in a region, the larger the exports to the homeland of the people that had migrated. We label this the '*immigrants effect*'.

Apart from these two effects that would enhance bilateral flows and that have been traditionally analysed in trade literature, there are additional channels of influence that could impact bilateral trade flows of the sectors linked to tourism activity. These additional channels arise from what could be considered as cross-sectional autocorrelation based on 'spatial or demographic' neighbouring, and they tend to connect each bilateral trade flow of services with the outflows or/and inflows from/to the neighbouring locations of the exporting and importing regions under consideration.

For origin and destination flows, LeSage and Pace (2008) described an 'origin – based

dependence' and a 'destination – based dependence'. The former refers to the fact that a flow from *i* to *j* is associated with those flows from neighbours of *i* to *j*; the latter (destination-based dependence') captures the relation between the flow from *i* to *j* and the flows from *i* to the neighbours of *j*[21]. Then, in the case of bilateral trade flows between regions *i* and *j*, exports from *i* to *j* could be associated with exports from *i* to neighbours of *j* (importer-based dependence) and with the exports from the neighbours of *i* to *j*.

Moreover, the concept of 'neighbouring region' could be defined from a geographic proximity or spatial contiguity perspective as in LeSage and Pace (2008), or more generally using proximity measured in terms of population demographic composition.

There could be **cross sectional dependence** between a given flow and a flow from the spatial neighbour (**contiguous regions**) of the neighbour of the exporting to the importing region (exporting – based dependence) and another flow from the exporting region to a neighbour of the importing region (importing – based dependence):

1. Export flows from a region *i* to a given region *j* can be correlated with exports from *i*'s neighbours to *j*. This spatial dependence could be caused because of different mechanisms:

   (a) Due to the 'taste effect', exports of service sectors linked to tourism from one region and the contiguous to a specific region may be related because people living in the importing region may choose one, the other or both destinations because these regions will have similar unobserved characteristics, such as weather, culture, etc.

   (b) In addition, it is easy to assume that people also have more information about the touristic options of any other region contiguous to the destination of the trip. Sharing common infrastructures can reinforce this channel.

2. Conversely, from the perspective of the importing region, there could also be some correlation between exports from a given region *i* to *j* and between the exports of the same region *i* and the neighbours of *j*. The mechanisms causing this type of spatial

[21] In LeSage and Pace (2008) a third 'origin-destination-based dependence' was described, which captures the relation between the flows between the neighbours of i and the neighbours of j. Like in Fisher and Griffith (2008), in this paper this relationship is not considered.

autocorrelation are equivalent to those described for the regions of origin of the flow (destination of the trips) but with forces acting in the opposite direction:

(a) Due to the 'taste effect', people living in a specific region (importing region, *j*) may choose similar destinations than those people living in a spatial neighbour of this region (neighbours of the importing region), since the probability that they will have similar unobserved characteristics (tastes, culture, preferences, etc.) is higher than with people living in remote regions.

(b) In addition, we can assume that people living in contiguous regions will have access to similar infrastructures and they could also have similar information about tourist options of any other region (exporting region, *i*).

For the case of **cross section autocorrelation** based on the **demographic structure** (network dependence) of the regions, we can also delineate two of these mechanisms (based on the concentration of the emigration stocks of each region):

1. The first one relates to historical patterns of emigration in a region with the current tourist decisions through the 'importing - based dependence'. If emigrants from a given region have concentrated in a group of host regions, then it is likely that a social network between the home and the host regions appears. People in this social network (i. e., all members of a family living in different regions) decide to travel periodically as tourist to the same region. Then, the imports of one region are not independent on the imports of its demographic neighbour. This cross relation between demographic neighbours of a region may introduce enhancing or competing effects for the positive relation of migrants and trade of our three services sectors. As noted earlier, immigration is influenced by gravity so 'demographic neighbours' could coincide with 'spatial neighbours'. However, alternative situations might also arise. For example, one might consider the Jewish Diaspora in general terms, and specifically after WWII when strong Jewish communities were organized in countries such as Israel, the US or Argentina, which are considerable distant one from the other, have strong community links, intense network ties and tourism relations. For the case of Spanish regions, both Madrid and Cataluña have large shares of immigrants that were born in Andalucía or Extremadura.

2. A second type of situation could give rise to an 'exporting–based dependence'. If the emigrants of one region are highly concentrated in other region, exports from the homeland to any other region *j* will be correlated to the exports from the host region to region *j*. The mechanisms that explain this dependence on the flows are similar to the one explained before, but acting in a different direction, affecting the destination of the trip (exporting region).

Finally, it is important to highlight that immigrants could also affect 'tourism decisions' of other non-immigrants living in the same region. For example, if we think of the large number of immigrants who form families with natives in a region, it is likely that there is an influence on immigrant tourism decisions arising from tastes and family ties that exert and influence on non-immigrants. For example, in the case of a 'mixed couple' (immigrant and non-immigrant) with two children, the decision to visit a relative in the home-land of one immigrant is conditioning travel decisions of three 'non-immigrants'. Moreover, relatives and friends of the immigrants who are still living in the home-land (but could interact regularly with them), could also spread their travel experiences and tastes among their co-nationals in the home-land. Although the diffusion of information and preferences would mainly take place within each region (the home-land and the host region), it could also be progressively spread to neighbouring regions. In Combes et al. (2005), this effect is described as the main force driving the relation between the 'information effect' and the 'border effect' in the case of interregional trade of goods. In our case, this force is mixed and strengthened by the effects described above.

In conclusion, we have described how the stock of immigrants and emigrants can influence the bilateral flows between two regions through different channels, but also how a given trade flow can be related to the flows to and from the contiguous regions and the demographic neighbours (regions that are demographically related because there is a large concentration of emigrants from one region in the other one, or because of a large share of the immigrants living in one region, were born in the other one). Furthermore, it could be assumed that all these influences could affect both immigrants and non-immigrant tourism decisions. These effects are summarized in **Figure 4.1** and in **Figure 4.2** that also introduce the notation for the relevant variables.

**Figure 4.1. Intuitive scheme showing the relation between tourist flows and migration stocks**

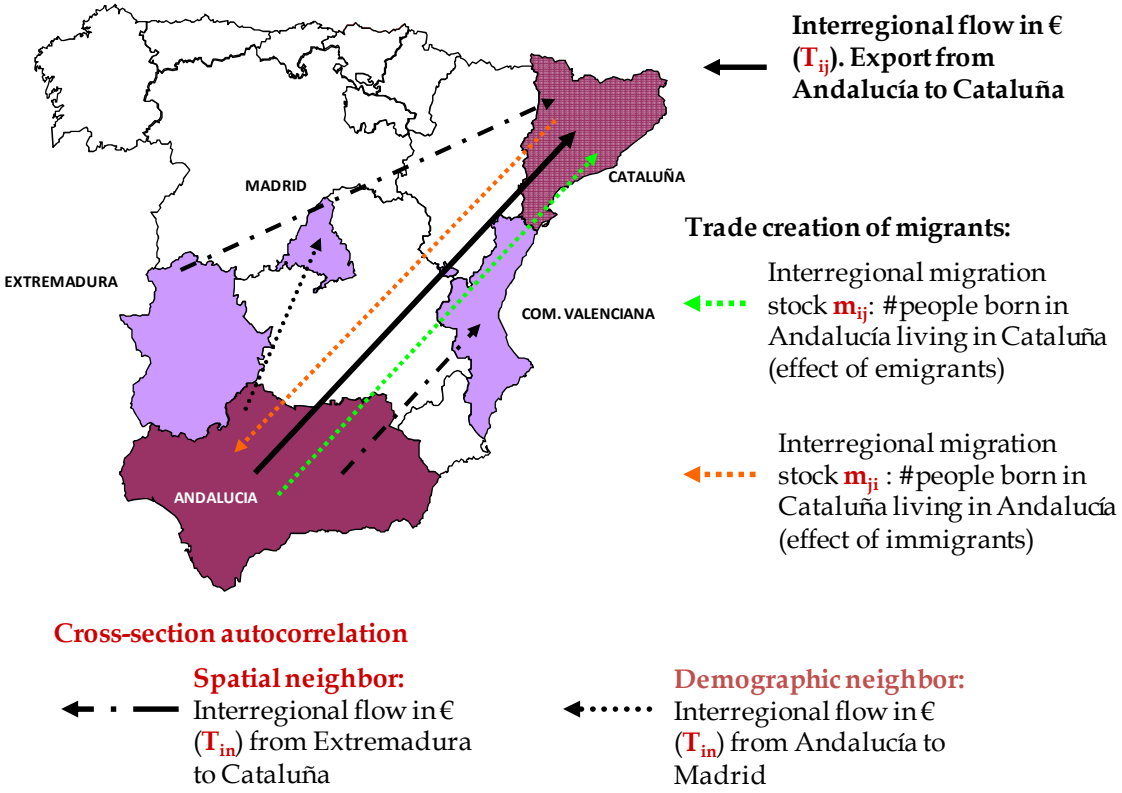
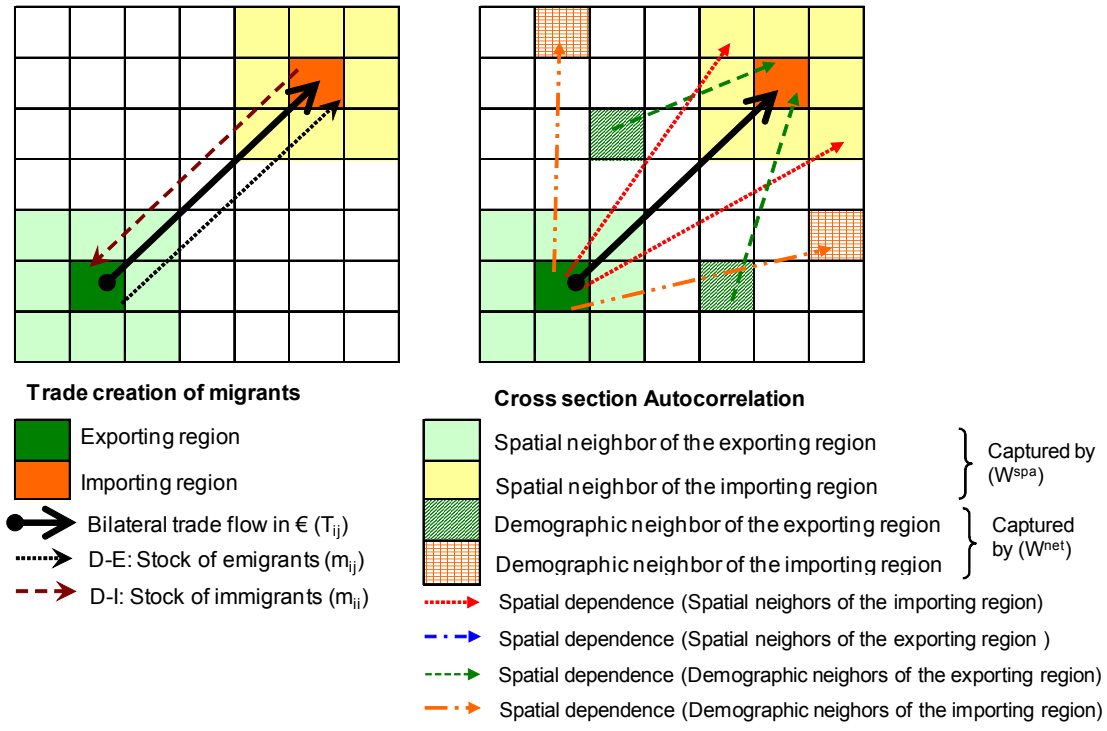



**Figure 4.2. Scheme summarizing the spatial and network effects on bilateral flows**



## 4.3. The empirical model

In this section, we first discuss the cross section dependence of the flows based on spatial and demographic neighbouring and how they are related to our spatial econometric model. A series of alternative specifications of increasing sophistication are set forth. These allow us to engage in a model comparison exercise that examines the alternative model specifications and results. The spatial econometric models introduced to accommodate spatial and network dependence in the flows follow from previous work by Autant-Bernard and LeSage (2011), LeSage and Pace (2008) and LeSage and Fisher (2008).

### 4.3.1. Spatial and demographic dependence affecting gravity model estimates

Black (1992) suggested that network and spatial autocorrelation may bias classical estimation procedures typically used for spatial interaction models. He suggested that "autocorrelation may (...) exist among random variables associated with the links of a network". Bolduc et al., (1992) suggested that classical gravity models do not consider the socio-economic and network variables adjacent to the bilateral origin-destination regions *i* and *j*, arguing that these should also be incorporated in the relationship that attempts to explain flows ( $T_{ij}$ ) between these regions. He emphasized that omission of neighboring variable values gives rise to spatial autocorrelation in the regression errors. Sources of spatial autocorrelation among errors are model misspecification and omitted explanatory variables that capture effects related to the physical and economic characteristics of the region (distances between zones, size of zones, lengths of frontiers between adjacent zones, etc.).

More recently, LeSage and Pace (2008) challenged the assumption that origin and destination (OD) flows in the classical gravity model contained in the dependent variable vector $T_{ij}$ exhibit no spatial dependence. They note that use of distance alone in a gravity model may be inadequate for modelling spatial dependence between observations. For most of socioeconomic spatial interactions (migration, trade, commuting, etc.), there are several explanations for these effects. For example, neighbouring origins (exporting regions) and destinations (importing region) may exhibit estimation errors of similar

magnitude if underlying latent or unobserved forces are at work so that missing covariates exert a similar impact on neighbouring observations. Agents located at contiguous regions may experience similar transport costs and profit opportunities when evaluating alternative nearby destinations. This similar positive/negative influence among neighbours could also be explained in terms of common factor endowments or complementary/competitive sectoral structures. For example, if natural factor endowments are key variables explaining patterns of trade specialization, neighbouring regions with similar factor endowments may be affected in a similar way by demand and supply shocks. Since a large number of factor endowments are conditioned by space (similar natural resources and climate, joint transport infrastructures, etc.), it would be easy to find spatial autocorrelation in the sector specialization of production and trade of regions, when the spatial scale is fine enough.

As we have explained in the previous section, bilateral trade flows of services linked with the tourist sector could also be affected by these sources of spatial dependence. In the next section, we formally test an extended gravity model specification that accounts for spatial and network (demographic in our case) autocorrelation effects in interregional trade flows associated with tourism. The extended model subsumes models that exclude spatial and network dependence as special cases of the more elaborate model, and provides a simple empirical test for the presence of significant spatial and network dependence.

Departing from this literature, our empirical model will be based on several alternative specifications that allow for considering two different weight matrices: the first one will be based on Autant-Bernard and LeSage (2011), which considers a spatial lag model with two different weight matrices; the second, will be based on the SAC model described in LeSage and Pace (2010, pp. 32), which considers spatial dependence in both the dependent variable and the disturbances.

### 4.3.2. Introducing spatial and network effects in the gravity model

A conventional least-squares gravity model specification is shown in eq. (1), where the bilateral flows ($T_{ij}$) between the exporting region *i* and the importing *j* are modelled as a function of a set of explanatory variables reflecting economic size of the two regions, and distance ($d_{ij}$) between the regions. $T_{ij}$ denotes the exports in monetary units (current Euros) of the services produced by Restaurants + Accommodation + Travel Agencies in region *i* and imported by region *j*. The size of the origin of the flow (exporting region) is

proxied by the gross value added of 'Hotels and Restaurants' in region *i* ($gva_i$), while the size of the importing region, *j,* is modelled as depending on the population ($pop_j$) and income ($inc_j$).

$$T_{ij} = \alpha i_N + gva_i\beta_1 + pop_j\beta_2 + inc_j\beta_3 + d_{ij}\beta_4 + \varepsilon_{ij} \quad (1)$$

The next two specifications in (2) and (3) include two alternative ways of controlling for the different nature of intraregional trade flows $T_{ii}$, which include expenses related to trips within each region as well as daily expenditures of residents on restaurants, coffee-shops, and pubs. The model described in (2) adds a dummy variable $ownreg_{ij}$ that takes a value 1 when trade is intraregional, and 0 otherwise. Past studies interpret the coefficient associated with this dummy variable as an 'internal border effect' or 'home bias' (McCallum, 1995; Helliwell, 1997; Wolf, 2000; Chen, 2004; Okubo, 2004; Combes et al. 2005). The coefficient $\gamma$ is interpreted as how many times one region tends to trade more within itself than with any other region in the country after controlling for size and bilateral distance. In this case, it cannot be interpreted as a traditional border effect that considers that it is in part due to informal barriers to trade, but it is a consequence of the daily consumption in these sectors.

$$T_{ij} = \alpha i_N + gva_i\beta_1 + pop_j\beta_2 + inc_j\beta_3 + d_{ij}\beta_4 + ownreg_{ij}\gamma + \varepsilon_{ij} \quad (2)$$

An alternative approach in (3) is that proposed by LeSage and Pace (2008), who create a separate set of explanatory variables to model intra-and inter-regional trade flows, those on the main diagonal of the flow matrix versus the off-diagonal. Regressors corresponding to the intraregional flows are set to zero in the set of explanatory variables $X = (gva_i, pop_j, inc_j)$ and used to form a new set of explanatory variables that we label $X_I = (gdp_j)$ for the $i^{th}$ observation. This prevents the large magnitudes typically associated with intraregional flows, from entering the interregional flow model explanatory variables and produces a separate set of explanatory variables to model variation in the intraregional flows ($T_{ii}$, *i = 1, ..., n*). Use of separate explanatory variables to explain variation in intraregional commodity flows should downweight the impact of large intraregional flows on the main diagonal of the flow matrix, preventing them from exerting undue impact on the resulting estimates for $\beta_1$, $\beta_2$ and $\beta_3$ which are intended to explain interregional flow variation. Since the matrix $X_I$ contains only *n* non-zero observations, we limit the number of explanatory variables used to explain variation in intraregional flows, using just the gdp of the region for this purpose. This suggests that the larger the economic activity in a region ($gdp$) the larger the intraregional flows of services,

mainly due to daily expenditures in Restaurants and the like services). Note that since interregional and intraregional trade flows are now modelled separately, the border dummy is meaningless and drops from this model. Note also that intraregional and interregional trade flows have also their corresponding intercept term.

$$T_{ij} = \alpha i_N + \alpha_i i_i + gva_i\beta_1 + pop_j\beta_2 + inc_j\beta_3 + d_{ij}\beta_4 + X_i\beta_i + \varepsilon_{ij} \quad (3)$$

The next model in eq. (4) has been used to account for trade creation effect of social networks. They are be measured by introducing the variable $m_{ij}$ that captures variation in trade flows attributable to the stock of emigrants from region *i* that are living in region *j* and similarly, the variable $m_{ji}$, that captures the variation in flows due to the stock of immigrants from region *j* living in region *i*. As in Combes et al. (2005), they can be introduced separately in such a way that if we set $\beta_5$ to be zero, we will just consider that there exist the immigrants effect and similarly if we force $\beta_6$ to be zero, we will only obtain the emigrants effect. Both effects can be estimated simultaneously if we impose no-restrictions in coefficients $\beta_5$ and $\beta_6$.

$$T_{ij} = \alpha i_N + \alpha_i i_i + gva_i\beta_1 + pop_j\beta_2 + inc_j\beta_3 + d_{ij}\beta_4 + X_I\beta_i + m_{ij}\beta_5 + m_{ji}\beta_6 + \varepsilon_{ij} \quad (4)$$

Although the previous specification is standard in the literature on trade and social networks, one may want to consider the presence of potential multicolinearity problems due to a high correlation between the emigrants and immigrants bilateral flows. In order to cope with this limitation, equation (5) will use a single vector of bilateral "net migration" $mig\_net_{tij} = (mig_{ji} + mig_{ij})$ for capturing the aggregate effect of immigrants+emigrants on trade. This specification will be considered also for the forthcoming augmented models including spatial and network effects.

$$T_{ij} = \alpha i_N + \alpha_i i_i + gva_i\beta_1 + pop_j\beta_2 + inc_j\beta_3 + d_{ij}\beta_4 + X_I\beta_i + mig\_net_{ij}\beta_5 + \varepsilon_{ij} \quad (5)$$

**The spatial lag gravity model**

In order to figure out whether the spatial dependence on the bilateral flows that have been discussed in the previous sections are consistent with the data, the next spatial regression models rely on spatial lags of the dependent variable following the approach set forth in LeSage and Pace (2008). They also include all the explanatory variables from the previous models, allowing these models to subsume the non-spatial regression models as special cases. A spatial lag of the dependent variable ($W^{spa}T_{ij}$) is introduced in eq. (5), where

$W^{spa}$ represents a spatial weight matrix of the form suggested by LeSage and Pace (2008), T is the $n^2 \times 1$ vector representing the n × n flows matrix transformed to a vector, $i_N$ is an $n^2 \times 1$ vector of ones, $d$ is the n × n matrix of interregional distances transformed to an $n^2 \times 1$ vector, $gva$, $pop$ and $inc$ are $n^2 \times 1$ vectors containing the explanatory variables appropriate for each bilateral flow and $\varepsilon$ is an $n^2 \times 1$ vector of normally distributed constant variance disturbances.

In a typical cross-sectional model with n regions, where each pair of regions represent an observation, spatial regression models rely on an $n \times n$ non-negative weight matrix that describes the connectivity structure between the $n$ regions. For example, $W_{ij} > 0$ if region $i$ is contiguous to region $j$. By convention, $W_{ii} = 0$ to prevent an observation from being defined as a neighbour to itself, and the matrix $W$ is typically row-standardized. In the case of bilateral flows, where we are working with $N = n^2$ observations, LeSage and Pace (2008), Chung (2008), Chun and Griffith (2011) and Fischer and Griffith (2008) suggest using $W^{spa} = W_j^{spa} + W_i^{spa}$, where $W_j^{spa} = I_N \otimes W_s$ represents an $N \times N$ spatial weight matrix that captures connectivity between the importing region and its neighbour, and $W_i^{spa} = W_s \otimes I_N$ is another $N \times N$ spatial weight matrix that captures connectivity between the exporting region and its neighbour[22]. We row-standardize the matrix $W^{spa}$, to form a spatial lag of the $N \times 1$ dependent variable.

LeSage and Pace (2008) note that the spatial lag variable captures both 'destination' and 'origin' based spatial dependence relations using an average of flows from neighbours to each origin (exporting) and destination (importing) region. Specifically, this means that flows from any origin to a particular destination region may exhibit dependence on flows from neighbours to this origin to the same destination, a situation labelled origin-based dependence by LeSage and Pace (2008). The spatial lag matrix, $W^{spa}$, also captures destination-based dependence, which is a term used by these authors to reflect dependence between flows from a particular origin region to neighbouring regions of the destination region.

We take a similar approach to produce a network dependence weight matrix, $W^{net}$, which captures network autocorrelation effects. As in the case of $W^{spa}$, the $W^{net}$ matrix was formed as a sum of two matrices that specify 'demographic neighbours' to the origin and destination regions, specifically $W^{net} = W_i^{net} + W_j^{net}$. The matrix $W_j^{net} = I_N \otimes W_m$ where $W_m$ was constructed using the stock of emigrants from each region living in each other region, with details provided in the next section. Similarly, $W_i^{net} = W_m \otimes I_N$, and the

[22] We use the symbol $\otimes$ to denote a kronecker product.

matrix $W^{net}$ was row-standardized. This allows us to include in the model a network lag of the dependent variable shown in eq. (5).

In the case of 'network autocorrelation', the 'tastes and information' could flow in both directions, which resulted in use of the two explanatory variables ($m_{ij}, m_{ji}$). Moreover, the additional "lodging savings" could also work in both directions: a person could take advantage of a second home (or a lodging owned by friends and relatives) located in the region where she was born (home region), but also this person can be visited by these friends and relatives in his house located in the region where he lives (host region), Thus, a rotated network weight matrix $W^{net\prime} = W_i^{net\prime} + W_j^{net\prime}$ can be used to capture the network autocorrelation acting in the opposite direction. This matrix could be used to replace the spatial lag $W^{net}$ in eq. (6).

We can include the two types of autocorrelation simultaneously, then a spatial lag as well as a network lag is included to account for the presence of both spatial and network dependence for origins and destinations. For the case of the spatial lag models (SAR), following Autant-Bernard and LeSage (2011) and LeSage and Fisher (2008), we adjust the weight matrices to produce row-standardization across both of these, accomplished by scaling each matrix by 0.5. Then, the scalar parameter ρ denotes the strength of spatial dependence in flows, and when this parameter takes a value of zero the model in eq. (6), it becomes the independent regression model. This allows us to carry out a simple empirical test for the statistical significance of spatial dependence in the flows. If both types of autocorrelation are not statistical significant, then the model in eq. (6) becomes the one in eq. (4).

$$T_{ij} = \alpha i_N + \alpha_i i_i + \rho_1 W^{spa} T_{ij} + \rho_2 W^{net} T_{ij} + gva_i \beta_1 + pop_j \beta_2 + inc_j \beta_3 + d_{ij} \beta_4 + X_i \beta_i + m_{ij} \beta_5 + m_{ji} \beta_6 + \varepsilon_{ij} \quad (6)$$

Then, as in equation (4), a new equation (7) can be defined, were immigrants and emigrant effects are added in a single net migration vector.

$$T_{ij} = \alpha i_N + \alpha_i i_i + \rho_1 W^{spa} T_{ij} + \rho_2 W^{net} T_{ij} + gva_i \beta_1 + pop_j \beta_2 + inc_j \beta_3 + d_{ij} \beta_4 + X_i \beta_i + mig\_net_{ij} \beta_5 + \varepsilon_{ij} \quad (7)$$

**The spatial general gravity model**

With the aim of adding some robustness regarding the way in which the autocorrelation effects are controlled for in the gravity equation, we now suggest an alternative specification, which will be based on the SAC model described in LeSage and Pace (2010, pp. 32). Such model, which considers spatial dependence in both the dependent variable and the disturbances, is described in eq (8):

$$\begin{aligned} T_{ij} &= \alpha i_N + \alpha_i i_i + \rho_1 W_1 T_{ij} + gva_i\beta_1 + pop_j\beta_2 + inc_j\beta_3 + d_{ij}\beta_4 + X_i\beta_i + m_{ij}\beta_5 + m_{ji}\beta_6 + u_{ij} \\ u_{ij} &= (I_N - \theta W_2)\varepsilon_{ij} \\ \varepsilon_{ij} &\sim (0, \sigma^2 I_N) \end{aligned} \quad (8)$$

Note that the model described in equation (8) considers two different weight matrices *W1* and *W2*, each of them will capture the effects affecting the dependent variable and the disturbance. Following the recommendations by LeSage and Pace (2010, pp. 32), in the next section we will consider 4 alternative cases: i) ($W_1$=$W^{spa}$; $W_2$=$W^{net}$); ii) ($W_1$= $W^{net}$; $W_2$= $W^{spa}$), iii) ($W_1$= $W_2$= $W^{spa}$),; iv) ($W_1$= $W_2$= $W^{net}$), without imposing a preferred structure to the data in advance.

For briefness, we omit including a new equation for describing the corresponding models in which the "net migration" vector is used instead of their emigrant and immigrant counterparts. However, the corresponding results are also analysed in the next section.

## 4.4. An application to the Spanish domestic trade of some services sectors

### 4.4.1. The Data

As in most countries, there are no official data on monetary interregional trade flows associated with the 3 sectors related to tourism in Spain that we are considering here: Restaurants, Accommodation and Travel Agencies. Our application takes advantage of recent estimates of intra and interregional trade flows for the grouping of these sectors between the Spanish regions. As it has been explained in detail in Chapter 2, the dataset has been obtained for the period 2000-2009 based on an improved methodology presented for the year 2001 in Llano and de la Mata (2009a). This dataset has been constructed as part of a larger research project (www.c-intereg.es). Schematically, the methodology used can be summarized in two steps:

1. The estimation of output in each region consumed by Spanish citizens, that is to say, that is not exported internationally;
2. Determining for each region the bilateral distribution of the output not exported internationally. This last step is based on existing information regarding daily expenses of national travellers in the destination region and origin and destination matrices (Familitur surveys and Occupancy Surveys) that capture overnight stays and displacements of Spanish residents, depending on the type of dwelling options at the destination of the trip. The estimation uses different daily expenses in '*Accommodation*' and '*Restaurants and the like*' for hotels, apartments, campgrounds, rural tourism, friends and relatives homes, second residences and excursions, covering all possible trip motives (leisure, work, education, etc.). The estimation has been done separately for Accommodation, Restaurants and Travel Agencies. Therefore, our data does not include expenses related to transportation, shopping or any other good or service bought during the stay. This fact avoids endogeneity problems between the interregional trade flows of the tourist services and the transport cost linked to the bilateral distance.
3. The bilateral flows of Accommodation is proportionally adjusted to the total output, the sum of the interregional exports of '*Restaurants and the like*' are adjusted to the output assuming that the difference is the daily consumption in this sector and Travel Agencies are considered to be an intra-regional consumption[23].

In summary, the estimates for the interregional monetary flows of the three service sectors analysed (Accommodation, Restaurants and Travel Agencies) the most accurate statistical sources available in Spain, obtaining figures that are constrained by the regional and national output of the sector (Instituto Nacional de Estadística, INE), the Balance of Payment (Bank of Spain) and the widest available sample of surveys on people movements within the country (Familitur, 2001).

Regarding the remaining variables, we use gross value added of the '*Hotels and Restaurants*' sector, the regional income (*inc*) obtained from the Spanish Regional Accounts (INE) and population (*pop*) from the Spanish Register (INE). Similarly, the interregional migration matrices are also obtained from the Spanish Register (INE), which offer information on the stock of people living in a region born other regions. The direct

[23] The econometric analysis has been also done without considering the daily consumption in Restaurants and without the consumption in travel agencies and similar results has been found. Note that these two types of flows just increase the intraregional flows.

effects captured by the $m_{ij}$ and the $m_{ji}$ terms enter as two independent column vectors. In order to avoid collinearity problems between the population and the intraregional migration stock (number of people born in a region living in that region), the latter is considered to be null for individuals that live in the same place where they were born ($m_{ii} = 0$). Following this strategy, this analysis differs from others that include the stock of people born in the same region and that measure how this produces a reduction in the coefficient related with the border effect (Garmendia et al., 2012).

The spatial weight matrices are built taking into account first order contiguity relations based on shared borders, with islands treated as having no adjacent regions. The demographic network weight matrix is built using a row standardized OD matrix of immigrants born in one region who are living in another, with diagonal elements set to zero values[24].

Finally, the distance used was obtained from the Movilia survey 2001 (Ministerio de Fomento, 2001), which is the actual distance travelled by the Spanish residents in their displacements, both within and between regions. One of the most interesting features of this measure is that it includes not just interregional distance but also intrarregional. Thus, in the line of Head and Mayer, (2010), we are able to escape from the a priori quantification of intrarregional distances assumed in other papers. Moreover, the distance used is an average of the actual distance travelled by each of the more than 500 million displacements estimated by the Movilia survey in 2001. These displacements cover all motives, so that the distance reported is not constrained by distance between capitals, which could be predominant for business trips, but would not account for distances between tourist spots (beaches, skiing resorts, countryside, etc.) located in the periphery.

As an overview of internal flows of the sectors considered in this study on Spain, Figure 3 shows the largest average interregional monetary flows in Accommodation and Restaurants[25], as well as the distribution of the population and the location coefficient for the 'Hotels and Restaurants' sector (LCRegion = Regional Hostel Industry GVA / National Hostel Industry GVA). Arrows between east-coastal regions (Andalucía, C. Valenciana and Cataluña) to the landlocked region of Madrid show that there are a large part of the

[24] In previous versions in which the empirical application used a previous dataset for 2001, alternative specifications of the $W^{net}$ matrix were explored based on percentages of the destination region population, or a binary matrix used in conjunction with a threshold (i.e. 5% of the population in the destination region). In the final analysis, since our trade flows are measured in levels we choose the current specification. This specification showed stronger results and avoids subjective decisions regarding a threshold level.

[25] Note that Travel Agencies are not included in this analysis because according to the methodology used, it is considered that this type of expense is done in the region of residence. Then, the whole part of the output not internationally exported is part of the intraregional flows.

interregional exports (in current Euros) of Accommodation and Restaurants from these regions to Madrid. These are the consequence of a large number of travels from Madrid to Andalucía. From the figure, it is easy to see that the larger exporting regions are located along the coast, with the largest importers located in the most populated high income regions. There are also large exports from the islands to high populated regions (Canarias to Madrid and Baleares to Madrid and Cataluña). In addition, there is a large share of the flows between the largest regions such as the exports from Cataluña to Madrid and Madrid to Cataluña or Andalucía. Note also that some of the larger interregional flows are between distant regions. Finally, there are strong flows from the landlocked larger regions to contiguous, richer regions (Castilla y León and Castilla – La Mancha to Madrid). These results can be explained firstly because of the size of the regions (in terms of population and income or gross domestic product) and secondly by important social networks that have arisen as a result of historical bilateral migration flows.

**Figure 4.3. Main interregional flows (€) of Accommodation and Restaurants % of total interregional flows. (Average 2000- 2009)**

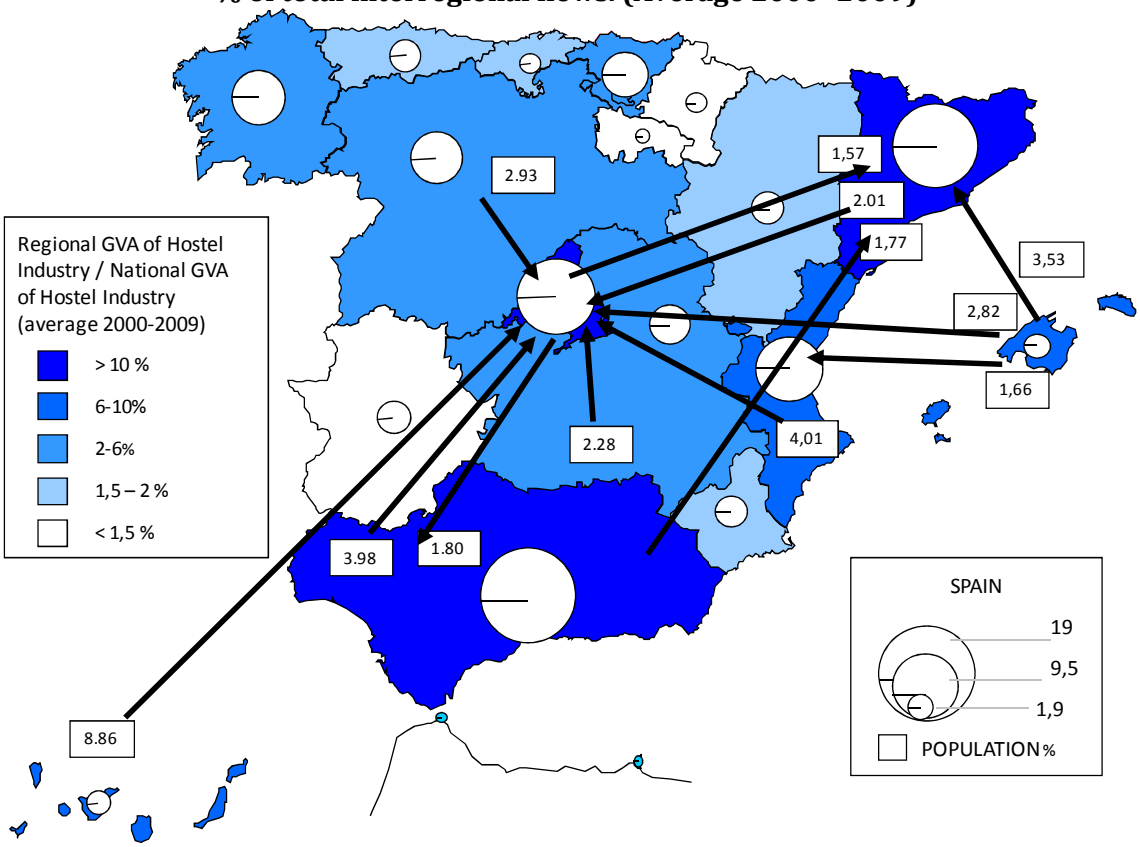


**Table 4.1: Description and source of the explanatory variables**

| Variable | Abbreviation | Description | Source |
|---|---|---|---|
| Gross Domestic Product | $gdp_i$ | Regional GDP. Average 2000-2009. | INE |
| Population | $pop_j$ | Regional Population. Average 2000-2009. | INE |
| Income per capita | $inc_j$ | Regional Income per capita. Average 2000-2009. | INE |
| Gross Value Added | $gva_i$ | G. V. A. of Hostel industry. Average 2000-2009. | INE |
| Interregional Migration Stock | $m_{ij}$ , $m_{ji}$ | Municipal Register. Average 2000-2009. | INE |
| Distance | $dist_{ij}$ | Distance in Km between regions. 2001 | Movilia, 2001 |

### 4.4.2. Estimation results

We compare estimation results from the sequence of models beginning with non-spatial models that assume no spatial or network dependence.

The alternative model specifications were estimated using 17 NUTS 2 level Spanish regions with Ceuta and Melilla excluded[26]. This dataset results in dependent and independent variable vectors having $N = 17 \times 17 = 289$ observations based on the average of the flows in the period 2000 - 2009. All the variables were averaged and logged transformed (except the dummy variables) as is traditional when estimating gravity models. The same specifications have been estimated for each year (the results for 2000 and 2009 are shown in the Appendix, and the results for the rest of the period are available upon request), but in this section we will comment the results with the averaged data that will reduce the effect of outliers.

**Table 4.2** shows least-squares estimation results for the seven different model specifications that we have labelled M1 through M7. Model M1 in the first column of the table shows estimates for the simplest gravity model, which attempts to explain variation in the 289 bilateral (Euro) flows between regions ($T_{ij}$) using $gva_i$, $pop_j$, $inc_j$ and distance $d_{ij}$ as explanatory variables. The simplest model based on these four explanatory variables is able to explain 70% of the variation in flows. All the explanatory variables are highly significant, and their signs as expected. For example, there are positive coefficients associated with the measures of economic size of importing and exporting regions

[26] Ceuta and Melilla are not regions, but autonomous cities. Their relevance from the spatial and touristic view point is very small. The data for these cities has not the required quality. In order to avoid noise in the estimation, they are omitted in the sample.

involved in the bilateral flow, and a negative coefficient for distance between origin and destination regions.

**Table 4.2. Ordinary Least Squares**

Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.

| | M1 | M2 | M3 | M4 | M5 | M6 | M7 |
|---|---|---|---|---|---|---|---|
| $R^2$ | 0.703 | 0.893 | 0.903 | 0.907 | 0.930 | 0.931 | 0.920 |
| $Rbar^2$ | 0.698 | 0.891 | 0.901 | 0.905 | 0.929 | 0.929 | 0.918 |
| *Sigma 2* | 0.954 | 0.344 | 0.313 | 0.300 | 0.225 | 0.226 | 0.260 |
| *Const* | -20.977*** | -26.36*** | -28.643*** | -26.127*** | -29.335*** | -29.533*** | -25.663*** |
| | -6.374 | -13.236 | -14.573 | -12.788 | -17.584 | -16.333 | -14.02 |
| $log(gva_i)$ | 0.937*** | 0.838*** | 0.882*** | 0.83*** | 0.54*** | 0.54*** | 0.675*** |
| | 16.964 | 25.02 | 26.74 | 23.506 | 12.601 | 12.562 | 16.745 |
| $log(pop_j)$ | 0.987*** | 0.931*** | 0.979*** | 0.863*** | 0.671*** | 0.676*** | 0.703*** |
| | 15.227 | 23.876 | 25.477 | 17.546 | 15.333 | 14.411 | 14.049 |
| $log(inc_j)$ | 1.002*** | 1.377*** | 1.479*** | 1.32*** | 1.978*** | 1.996*** | 1.476*** |
| | 3.33 | 7.585 | 8.3 | 7.346 | 12.488 | 11.672 | 9.102 |
| $Log\ (dist_{ij})$ | -1.087*** | -0.469*** | -0.478*** | -0.393*** | -0.131** | -0.133** | -0.226*** |
| | -16.153 | -9.586 | -10.253 | -7.677 | -2.544 | -2.555 | -4.228 |
| $Ownreg_{ij}$ | | 3.984*** | | | | | |
| | | 22.45 | | | | | |
| *Intra_const* | | | -2.266 | -2.407 | -2.842 | -2.839 | -2.684 |
| | | | -0.865 | -0.939 | -1.279 | -1.276 | -1.125 |
| *Intra_gdp* | | | 1.099*** | 1.088*** | 1.052*** | 1.052*** | 1.065*** |
| | | | 7.289 | 7.366 | 8.217 | 8.205 | 7.752 |
| $log(m_{ij})$ | | | | 0.108*** | | -0.008 | |
| | | | | 3.656 | | -0.286 | |
| $log(m_{ji})$ | | | | | 0.344*** | 0.348*** | |
| | | | | | 10.537 | 9.644 | |
| $Mig\_net_{ij}$ | | | | | | | 0.14*** |
| | | | | | | | 7.702 |

t statistics in parenthesis. All variables are averages in the period 2000-2009.

In the second column the intraregional flows are controlled including the border effect dummy '*ownreg*'. The 'border-effect' coefficient estimate (3.984) is very large and consistent with other empirical findings regarding border effects in Spain, for industries such as 'Chemical products' or 'Non-metallic minerals' (Ghemawat et al. 2010; Requena and Llano, 2010). As discussed in (Llano and de la Mata, 2009a), a large coefficient of the border effect for the analysed sectors likely arises from the importance of 'Restaurants' within the grouping of sectors considered (more than the 50% of the output), which is

heavily oriented towards intraregional trade flows[27]. An interesting consequence of introducing the border dummy is that the negative coefficient on the distance variable decreases in absolute value from −1.087 to −0.468. As a robustness check, model M3 produced similar estimates when the border dummy variable in eq.(2) is replaced by the $X_I$ matrix as explained in the discussion surrounding eq.(3). The stability of the results obtained for these two last models points out to the validity of both methods for controlling for the different nature of intraregional/interregional flows.

Next, models M4 and M5 separately include the two variables regarding the stock of migrants in order to measure the trade creation effect of social networks. The coefficient estimates for these two variables point to a positive (and significant) relation between the bilateral stocks of emigrants and immigrants and domestic flows when they are considered separately. It is noteworthy that the coefficient of distance drops to -0.393 when the stock of emigrants is included and to -0.131[28] when we include the stock of immigrants. Finally, it is important to highlight that although both emigrants and immigrants are significant when they are included separately, when we include both together, it is just the stock of immigrants the one that is significant. In addition of the control variables $m_{ij}$ and $m_{ji}$, lead to a higher $R^2$ = 92% than the simpler model specifications.

At this point, it is interesting to discuss in more detail the results obtained regarding the relation between the trade flows and the stock of interregional emigrants and immigrants. Although the inclusion of these two variables is standard in the literature (Combes et al., 2005), both are highly correlated (87% between $m_{ij}$ and $m_{ji}$, when both vectors include "0" values for the intraregional flows). In order to avoid multicolinearity problems, an additional model (M7) is included, where the two variables are added together as net migration vector $mig\_net_{ij} = (mig_{ji} + mig_{ij})$. As we can see, now the coefficient for the new variable of net migration is positive and significant, but the rest of the results are not altered.

Departing from this first estimates, and with the aim of motivating the inclusion of spatial

[27] This is partially a result of own-region holiday spending in restaurants and pubs which accounts for a large share of income spent relative to expenditures on hotels, travel-agencies, restaurants and similar businesses in other regions.

[28] In previous versions of the paper based on an alternative database for 2001 in this specification the coefficient of distance was not statistically significant. That result was interpreted as an indicator of that after controlling for situations where: people are not travelling within the region, or visiting their home-land, or visiting the host region with co-nationals already settled; distance does not produce friction to more distant regions. This result seems consistent with the casual observation regarding the tendency of population from high income, highly populated regions such as Madrid travelling to coastal regions for vacations.

lag and/or spatial error terms, several statistical tests are considered. This analysis is conducted by computing the I-Moran, the LM-lag and the LM-error statistics over the residuals obtained for the 7 models. In all of them the spatial structure based on three different spatial weight matrices were considered (each one of them row normalized): i) $W_i^{spa}$, for capturing the "spatial-origin-based" autocorrelation; ii) $W_j^{spa}$, for capturing the "spatial-destination-based" autocorrelation; and ($W^{spa}=W_i^{spa}+W_j^{spa}$), for capturing the aggregate spatial autocorrelation (omitting, as said before, the origin-to-destination-based element). The results for these 7 models, 3 tests and 3 spatial autocorrelation matrices are reported in **Table 4.3**, showing that for almost all cases the presence of spatial autocorrelation in the residuals is confirmed (Moran I analysis). Such result is found for the 'origin-based' and 'destination-based' weight matrices, as well as when both are mixed in a single spatial matrix ($W^{spa}=W_i^{spa}+W_j^{spa}$). Regarding the LM tests, in all cases but 1 (Model 1, LM error tests for spatial correlation in the dependent variable) the test confirmed the suitability of a spatial lag model (SAR) as well as a spatial autoregressive error model (SEM). In order to be able to consider two alternative weight matrices in the same specification, the spatial dependence in the disturbance will be considered in the general model (SAC) instead of a simple SEM.

Then, a similar exercise is conducted using the network (demographic) weight matrices for analysing the results for the same 7 models. Now, the results are reported in Table 4.4, considering three alternative demographic based weight matrices, namely, the origin-based demographic neighbour structure ($W_i^{net}$), the destination-based demographic neighbour structure ($W_j^{net}$), and the aggregate origin+destination based demographic neighbour structure ($W^{net}= W_i^{net} + W_j^{net}$). Like in the previous table, the results confirm the presence of "network" autocorrelation in the residuals (Moran I analysis on the residuals), as well as the appropriateness of both a spatial lag model (SAR) and a spatial autoregressive error model (SEM).

In addition, **Figure 4.4** reports the scatterplots for the residuals of the main 6 models using the row normalized spatial matrix ($W^{spa}=W_i^{spa}+W_j^{spa}$), for capturing the aggregate spatial autocorrelation of both exporting and importing regions. As in LeSage and Pace (2010) each graph is divided in 4 quadrants: Q-I (red points): *ij* flows that have residuals above the mean, where the average neighbouring ij flows (orgin-based+destination-based) is also greater than the mean; Q-II (green points): *ij* flows that have residuals below the mean, but the average of neighbouring ij flows is above the mean; Q-III (blue points): *ij* flows with residuals below the mean and the average of the neighbouring ij flows is also below the mean; Q-IV (purple points): *ij* flows that have residuals above the mean, and the

average neighbouring ij flows is below the mean. In a similar way, **Figure 4.5** reports the scatterplots for the residuals of the main 6 models using the row normalized network (demographic) weight matrix ($W^{net} = W_i^{net} + W_j^{net}$).

By means of the scatter plot we can verify a positive association between the residuals (horizontal axis) and the spatial lag (vertical axis). The magnitude of this positive association will be greater the shorter the number of green and purple points, and the larger the number of blue and red ones. Conversely to other papers using Scatterplot, since our dataset is referred to origin-destination flows, the residuals cannot be plotted in a map. Such graphical analysis will required the use of specialized GIS systems for transport modelling (Berglund and Karström, 1999, 2001; Berglund, 2001), which is beyond the scope of this paper. The results shown in **Figure 4.4** and **Figure 4.5** suggest the presence of a positive association between the residuals of the 6 main models obtained by a simple OLS estimate procedure and the two different cross-section autocorrelation structures –one pure spatial, and the other pure demographic- under consideration. It is also worth mentioning the differences in the shapes of the dot clouds obtained with each weight matrix, which indicates the complementary nature of both structures. Such differences would also be observed when running the 4 alternative SAC models.

**Table 4.3. Testing Spatial Dependence. Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.**

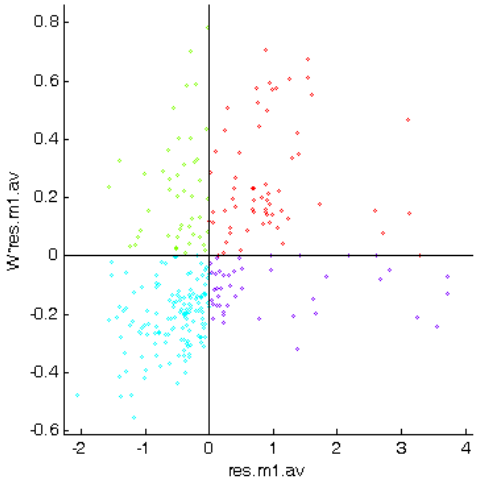
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 |
|---|---|---|---|---|---|---|---|
| **Spatial "origin-based" autocorrelation using row normalized first contiguity "Wo"** | | | | | | | |
| **Moran I-test for spatial correlation in residuals** | | | | | | | |
| Moran I | 0.087 | 0.239 | 0.229 | 0.226 | 0.214 | 0.217 | 0.198 |
| Moran I-statistic | 2.414 | 6.137 | 5.868 | 5.838 | 5.578 | 5.672 | 5.152 |
| Marg. Probability | 0.016 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| mean | -0.011 | -0.011 | -0.010 | -0.011 | -0.012 | -0.013 | -0.011 |
| Standard deviation | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 |
| **LM error tests for spatial correlation in residuals** | | | | | | | |
| LM value | 4.432 | 33.233 | 30.379 | 29.777 | 26.757 | 27.324 | 22.845 |
| Marg. Probability | 0.035 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **LM error tests for spatial correlation in the dependent variable** | | | | | | | |
| LM value | 32.726 | 12.739 | 15.847 | 49.565 | 43.450 | 55.206 | 73.533 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **Spatial "destination-based" autocorrelation using row normalized first contiguity "Wd"** | | | | | | | |
| **Moran I-test for spatial correlation in residuals** | | | | | | | |
| Moran I | 0.234 | 0.369 | 0.350 | 0.392 | 0.364 | 0.361 | 0.423 |
| Moran I-statistic | 5.938 | 9.236 | 8.758 | 9.876 | 9.144 | 9.167 | 10.617 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| mean | -0.009 | -0.009 | -0.009 | -0.011 | -0.010 | -0.012 | -0.010 |
| Standard deviation | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 | 0.041 |
| **LM error tests for spatial correlation in residuals** | | | | | | | |
| LM value | 31.786 | 79.218 | 71.183 | 89.432 | 77.094 | 75.952 | 104.238 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **LM error tests for spatial correlation in the dependent variable** | | | | | | | |
| LM value | 0.640 | 38.234 | 32.657 | 46.159 | 17.635 | 19.157 | 40.986 |
| Marg. Probability | 0.424 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **Spatial autocorrelation using row normalized 1st contiguity "W=(Wo+Wd)"** | | | | | | | |
| **Moran I-test for spatial correlation in residuals** | | | | | | | |
| Moran I | 0.186 | 0.339 | 0.327 | 0.398 | 0.346 | 0.342 | 0.434 |
| Moran I-statistic | 5.954 | 10.578 | 10.205 | 12.485 | 10.859 | 10.869 | 13.543 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| mean | -0.011 | -0.011 | -0.011 | -0.013 | -0.013 | -0.015 | -0.013 |
| Standard deviation | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 |
| **LM error tests for spatial correlation in residuals** | | | | | | | |
| LM value | 29.820 | 99.117 | 92.312 | 136.962 | 103.486 | 100.934 | 162.969 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **LM error tests for spatial correlation in the dependent variable** | | | | | | | |
| LM value | 3.966 | 21.438 | 12.062 | 11.273 | 2.996 | 2.968 | 6.951 |
| Marg. Probability | 0.046 | 0.000 | 0.001 | 0.001 | 0.083 | 0.085 | 0.008 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |

**Table 4.4. Testing Demographic Dependence. Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.**

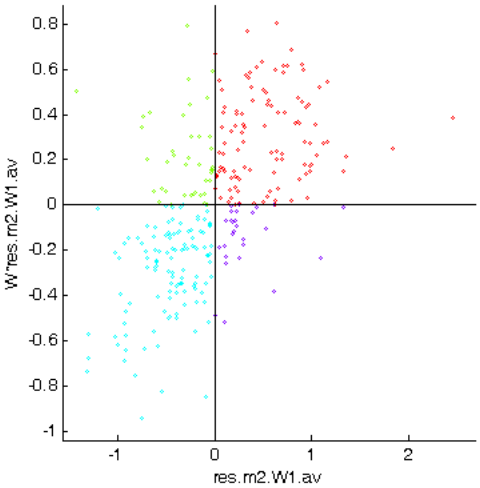
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 |
|---|---|---|---|---|---|---|---|
| **Spatial "origin-based" autocorrelation using row normalized first contiguity "$Wo^{net}$"** | | | | | | | |
| **Moran I-test for spatial correlation in residuals** | | | | | | | |
| Moran I | 0.067 | 0.084 | 0.118 | 0.128 | 0.089 | 0.091 | 0.092 |
| Moran I-statistic | 2.665 | 3.234 | 4.365 | 4.737 | 3.437 | 3.550 | 3.504 |
| Marg. Probability | 0.008 | 0.001 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 |
| mean | -0.012 | -0.012 | -0.011 | -0.011 | -0.012 | -0.013 | -0.011 |
| Standard deviation | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.029 |
| **LM error tests for spatial correlation in residuals** | | | | | | | |
| LM value | 4.633 | 7.239 | 14.315 | 16.935 | 8.113 | 8.458 | 8.724 |
| Marg. Probability | 0.031 | 0.007 | 0.000 | 0.000 | 0.004 | 0.004 | 0.003 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **LM error tests for spatial correlation in the dependent variable** | | | | | | | |
| LM value | 2.236 | 66.779 | 67.056 | 62.740 | 33.016 | 33.260 | 44.913 |
| Marg. Probability | 0.135 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **Spatial "destination-based" autocorrelation using row normalized first contiguity "$Wd^{net}$"** | | | | | | | |
| **Moran I-test for spatial correlation in residuals** | | | | | | | |
| Moran I | 0.240 | 0.346 | 0.362 | 0.423 | 0.368 | 0.364 | 0.468 |
| Moran I-statistic | 8.249 | 11.746 | 12.294 | 14.544 | 12.533 | 12.621 | 15.962 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| mean | -0.007 | -0.007 | -0.007 | -0.009 | -0.008 | -0.010 | -0.008 |
| Standard deviation | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 |
| **LM error tests for spatial correlation in residuals** | | | | | | | |
| LM value | 59.609 | 123.241 | 135.533 | 184.866 | 139.951 | 136.724 | 226.175 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **LM error tests for spatial correlation in the dependent variable** | | | | | | | |
| LM value | 2.946 | 44.939 | 50.874 | 46.572 | 13.468 | 15.701 | 23.097 |
| Marg. Probability | 0.086 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **Spatial autocorrelation using row normalized 1st contiguity "$W^{net}=(Wo^{net}+Wd^{net})$"** | | | | | | | |
| **Moran I-test for spatial correlation in residuals** | | | | | | | |
| Moran I | 0.184 | 0.242 | 0.265 | 0.345 | 0.257 | 0.252 | 0.373 |
| Moran I-statistic | 7.674 | 9.984 | 10.880 | 14.197 | 10.631 | 10.592 | 15.261 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| mean | -0.010 | -0.010 | -0.009 | -0.011 | -0.010 | -0.012 | -0.010 |
| Standard deviation | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| **LM error tests for spatial correlation in residuals** | | | | | | | |
| LM value | 47.874 | 82.878 | 99.350 | 168.070 | 93.428 | 89.669 | 196.911 |
| Marg. Probability | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |
| **LM error tests for spatial correlation in the dependent variable** | | | | | | | |
| LM value | 5.669 | 39.780 | 39.577 | 39.564 | 11.331 | 11.500 | 24.928 |
| Marg. Probability | 0.017 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 |
| chi(1) 0.01 value | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 | 17.611 |

**Figure 4.4. I-Moran Scatterplot on residuals from OLS estimates.**
Y = Residuals from Models 1-6. $W^{spa}= (W_i^{spa}+W_j^{spa})$ 1st order contiguity matrix row normalized

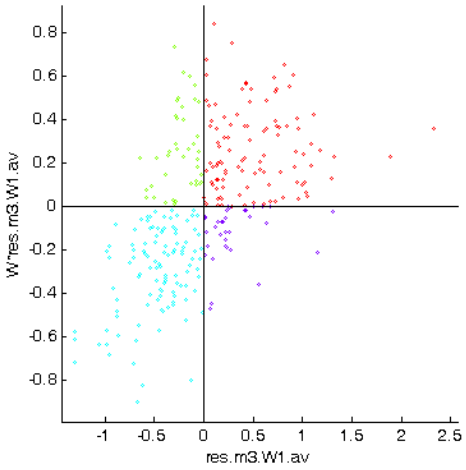
M1-OLS



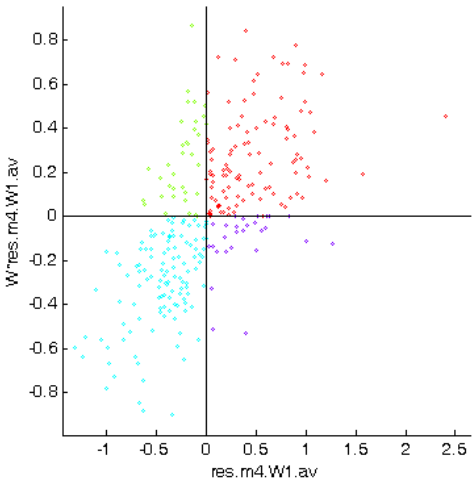

M2-OLS



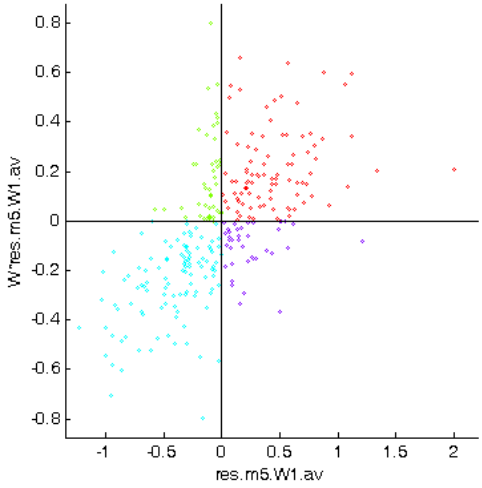

M3-OLS




M4-OLS




M5-OLS




M6-OLS

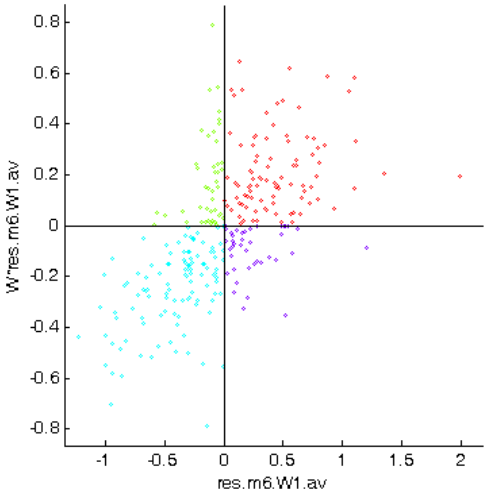
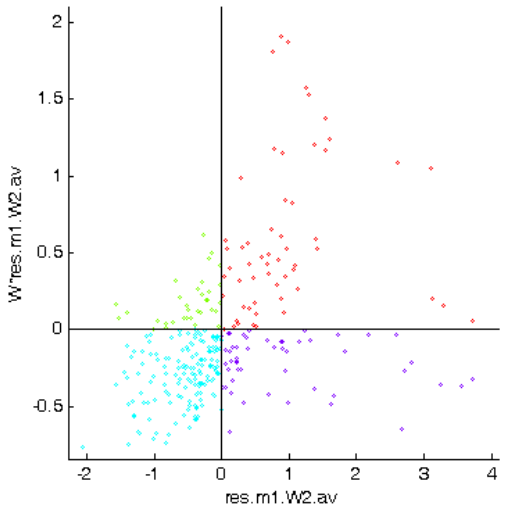
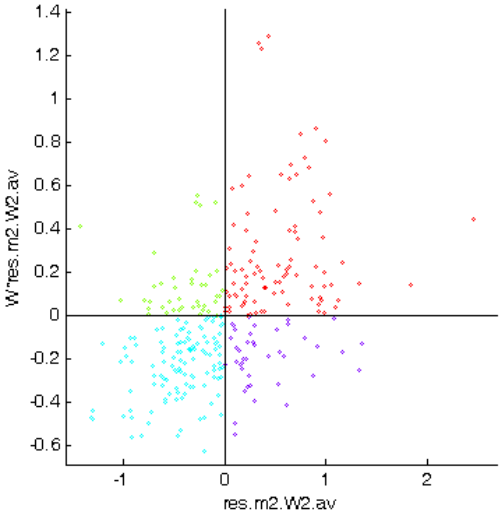


**Figure 4.5. I-Moran Scatterplot on residuals from OLS estimates.**
Y = Residuals. Models 1-6. $W^{net}= (W_i^{net}+W_j^{net})$ 1st order demographic matrix row normalized

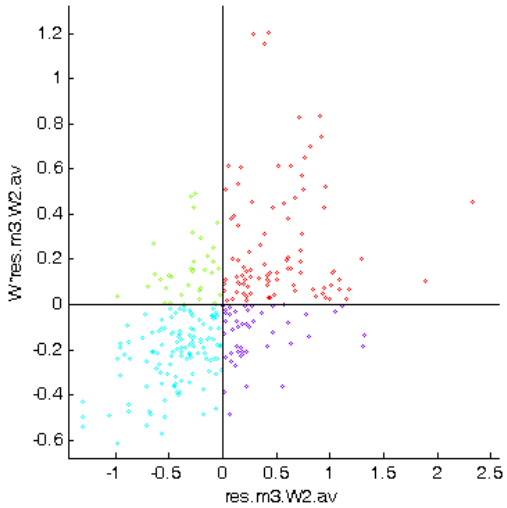
M1-OLS



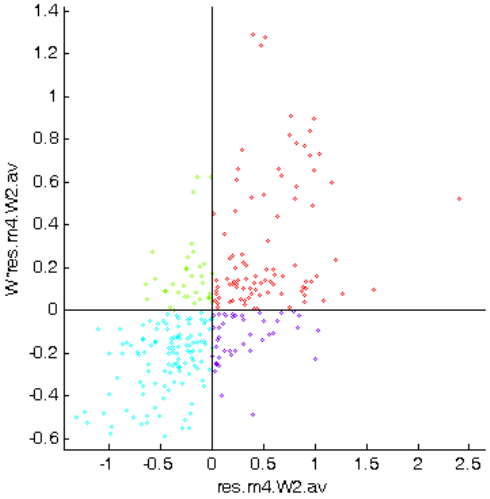

M2-OLS



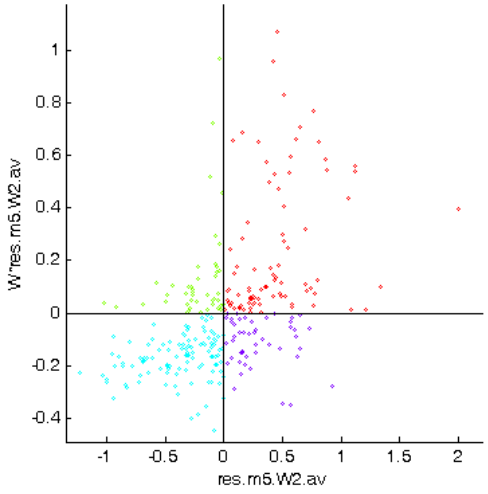

M3-OLS



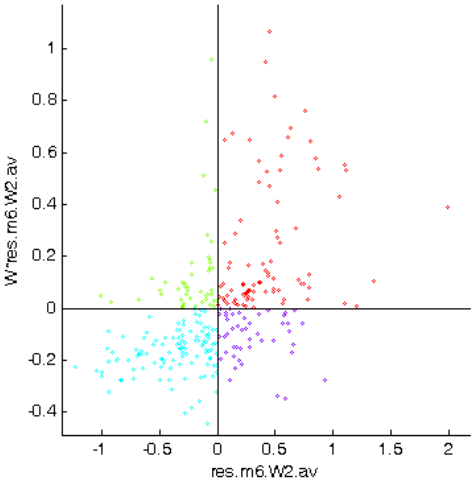

M4-OLS




M5-OLS




M6-OLS



Next we analyse the results obtained for the augmented gravity models that consider the presence of spatial and/or network (demographic in our case) effects. Before doing that, it is important to have in mind that the coefficient estimates on the explanatory variables in these models are not interpretable in the same fashion as those from the non-spatial models, a point made in LeSage and Pace (2009), Chapter 8. However, as we will see, the sign of the coefficient estimates reflect the correct direction of impact on flows that would arise from changes in the explanatory variables[29].

Estimation results for the spatial lag model (SAR) specifications are shown in Table 4. These models were estimated using maximum likelihood methods (see LeSage and Pace (2009), Chapter 3). As opposed to the non-spatial least-squares estimates, these models allow for the spatial spillover effects to neighbouring regions as well as network spillover influences, both of which were motivated in the previous section. The non-spatial models restrict spatial and network spillover influences to be zero, since each bilateral flow is treated as independent of all other flows.

In model M7, M1 is extended by including the 2 autocorrelation terms $\rho_1$ (spatial effects) $\rho_2$ (network effects) without the immigration variables. All the coefficients are significant and with the expected signs, including the ones indicating the presence of spatial and demographic autocorrelation effects in the bilateral trade flows. Then, models M8 and M9 add –separately- the variables capturing the emigrant ($m_{ij}$) and immigrant ($m_{ji}$) effects. In this case, all the new variables have positive and significant coefficients, with the exception of the spatial autocorrelation effect that appears to be non-significant when it is included with the immigrant vector in M9. The difference between the fully specified models M10 and M11 (that include the full set of explanatory variables) is the use of the rotated version $W^{net'}$ in model M11 in place of $W^{net}$ for model M10. This alternative specification of the network effect is supported by the idea that the demographic linkages are bi-directional, that is, they can produce pull and push effects (through taste and information channels) in the 'demographic' neighbours of the exporting and importing regions, both based on the historical patterns of emigration and immigration. As before, in M10 and M11, the emigrant effect ($m_{ij}$) is non-significant when it is included together with the immigrants ($m_{ji}$). The spatial effect appears to be non-significant for M10 but it is for M11. According to the likelihood function values, the higher $R^2$ and lower noise variance

[29] The correct approach to calculating partial derivatives showing the impact of changes in the explanatory variables on the dependent variable in spatial gravity models is an issue studied in Lesage and Thomas-Agnan (2012).

estimate($\widehat{\sigma^2}$[30]), model M11 has the best goodness of fit. Finally, two more models (M12 and M13) are included, with the aim of testing to what extent the results are sensible to the inclusion of one single vector of net-migration instead of the 2 previous ones for emigrants and immigrants. It is worth mentioning that like in M10, the spatial effect also appears to be non-significant in M12. The rest of the results do not vary significantly.

**Table 4.5. Spatial Autoregressive Model**

Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.

| | M7 | M8 | M9 | M10 | M11 | M12 | M13 |
|---|---|---|---|---|---|---|---|
| *Pseudo $R^2$* | 0.916 | 0.919 | 0.933 | 0.933 | 0.934 | 0.926 | 0.925 |
| *Rbar²* | 0.915 | 0.917 | 0.932 | 0.931 | 0.932 | 0.924 | 0.924 |
| *Sigma 2* | 0.264 | 0.256 | 0.211 | 0.211 | 0.208 | 0.233 | 0.235 |
| *Log likelihood* | -624.503 | -619.881 | -591.052 | -591.036 | -589.562 | -605.741 | -607.321 |
| *Const* | -28.51*** | -26.561*** | -29.176*** | -29.291*** | -30.586*** | -26.13*** | -27.316*** |
| | -15.815 | -14.089 | -18.097 | -16.791 | -17.630 | -15.085 | -15.686 |
| *log(gva$_i$)* | 0.714*** | 0.683*** | 0.502*** | 0.502*** | 0.51*** | 0.592*** | 0.624*** |
| | 23.584 | 20.972 | 12.115 | 12.108 | 12.362 | 15.517 | 16.267 |
| *log(pop $_j$)* | 0.809*** | 0.729*** | 0.627*** | 0.63*** | 0.637*** | 0.632*** | 0.652*** |
| | 22.950 | 16.055 | 14.831 | 13.932 | 14.146 | 13.334 | 13.682 |
| *log(inc $_j$)* | 1.554*** | 1.425*** | 1.947*** | 1.958*** | 2.05*** | 1.53*** | 1.588*** |
| | 9.506 | 8.592 | 12.725 | 11.870 | 12.495 | 9.972 | 10.291 |
| *Log (dist$_{ij}$)* | -0.385*** | -0.323*** | -0.131*** | -0.132*** | -0.136*** | -0.204*** | -0.212*** |
| | -9.001 | -6.838 | -2.630 | -2.632 | -2.736 | -4.036 | -4.156 |
| *Intra_const* | -1.507 | -1.653 | -2.38 | -2.383 | -2.217 | -2.045 | -1.862 |
| | -0.627 | -0.699 | -1.108 | -1.110 | -1.038 | -0.906 | -0.821 |
| *Intra_gdp* | 0.834*** | 0.84*** | 0.925*** | 0.926*** | 0.897*** | 0.878*** | 0.868*** |
| | 6.027 | 6.165 | 7.473 | 7.484 | 7.293 | 6.756 | 6.642 |
| *log(m$_{ij}$)* | | 0.084*** | | -0.005 | -0.021 | | |
| | | 3.092 | | -0.171 | -0.778 | | |
| *log(m$_{ji}$)* | | | 0.297*** | 0.3*** | 0.306*** | | |
| | | | 9.426 | 8.617 | 8.833 | | |
| *Mig_net$_{ij}$* | | | | | | 0.114*** | 0.109*** |
| | | | | | | 6.622 | 6.317 |
| *$\rho_1$ (spat)* | 0.091* | 0.089* | 0.047 | 0.046 | 0.054* | 0.07 | 0.093** |
| | 1.936 | 1.896 | 1.102 | 1.083 | 0.000 | 1.589 | 2.115 |
| *$\rho_2$ (demo)* | 0.557*** | 0.52*** | 0.279*** | 0.277*** | 0.342*** | 0.399*** | 0.393*** |
| | 5.617 | 4.435 | 2.924 | 2.903 | 2.637 | 4.114 | 2.785 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables are averages in the period 2000-2009.

[30] The $R^2$ was calculated using $\hat{y}'\hat{y}/y'y$, where $\hat{y} = (I_N - \rho_1 W^{spa} - \rho_2 W^{net})X\hat{\beta}$.

After confirming the presence of spatial and demographic autocorrelation of the flows, it is interesting to test if similar patterns exist in the residuals of the model and if a SAC model could beat the SAR specification capturing such effects and explaining the bilateral trade flows.

Now we focus on the results using the general spatial model and the 4 specifications described before: SAC-I: ($W_1$=$W^{spa}$; $W_2$=$W^{net}$); SAC-II: ($W_1$= $W^{net}$; $W_2$= $W^{spa}$), SAC-III: ($W_1$= $W_2$= $W^{spa}$); SAC-IV: ($W_1$= $W_2$= $W^{net}$). For brevity, we will focus on the results for M10 and M12 –the two with the better fits in the SAR model-, which are reported in **Table 4.7**. However, before doing so, it is interesting to briefly review the results obtained for the rest of the models, which are in turn reported in the Appendix. We just now comment the main outcomes of SAC-I and SAC-II, comparing them with the ones from the SAR specifications. Interestingly, the main results are robust with the ones reported in the previous table based on the SAR specifications. As in the SAR specifications, in M7, both the spatial ($\rho$) and demographic ($\theta$) effects are significant, while in M9-M11 they are not. It is also remarkable that estimates with SAC-I for models M8-M11 register positive and significant coefficients for the "emigrant effect" ($m_{ij}$) even when it is considered together with the immigrant effect ($m_{ji}$). Again, like in most of the SAR models (**Table 4.5**), the demographic effects ($\theta$) are always strong, positive and significant while the spatial ones don not ($\rho$). Regarding the general spatial model SAC-II, the results are in line with the ones obtained in the previous specifications, although some strange outcomes are obtained for some specific cases. For example, the results for M7 fits with the ones reported in the previous two augmented models (SAR, SAC-I), finding positive and significant spatial and network (demographic) autocorrelation effects, as well as the expected signs for the rest of the variables. Then, in coherence with the results in the previous SAC-I specifications, both emigrant and immigrant effects are always positive and significant. However, in this case we find high positive and significant spatial effects affecting the residuals, while the network structure used for lagging the dependent variable register weaker and -sometimes- negative coefficients.

**Table 4.6. Spatial General Model**

Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.

| | **SAC-I** | | **SAC-II** | | **SAC-III** | | **SAC-IV** | |
|---|---|---|---|---|---|---|---|---|
| | $W_1=W^{spa}$; $W_2=W^{net}$ | | $W_1=W^{net}$; $W_2=W^{spa}$ | | $W_1=W_2=W^{spa}$ | | $W_1=W_2=W^{net}$ | |
| | M10 | M12 | M10 | M12 | M10 | M12 | M10 | M12 |
| *Pseudo $R^2$* | 0.951 | 0.951 | 0.964 | 0.964 | 0.962 | 0.962 | 0.955 | 0.955 |
| *Rbar²* | 0.950 | 0.950 | 0.963 | 0.963 | 0.961 | 0.961 | 0.954 | 0.954 |
| *Sigma 2* | 0.158 | 0.158 | 0.117 | 0.117 | 0.122 | 0.122 | 0.147 | 0.146 |
| *N. Draws* | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| *N. Omitted* | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| *Const* | -27.55*** | -26.25*** | -22.69*** | -22.84*** | -24.74*** | -24.74*** | -25.19*** | -23.99*** |
| | 1.840 | 1.554 | 2.545 | 2.392 | 2.328 | 2.200 | 1.920 | 2.284 |
| *log($gva_i$)* | 0.56*** | 0.6*** | 0.519*** | 0.516*** | 0.513*** | 0.513*** | 0.548*** | 0.583*** |
| | 0.049 | 0.040 | 0.042 | 0.041 | 0.042 | 0.041 | 0.047 | 0.040 |
| *log($pop_j$)* | 0.623*** | 0.613*** | 0.576*** | 0.575*** | 0.564*** | 0.562*** | 0.581*** | 0.567*** |
| | 0.058 | 0.058 | 0.052 | 0.053 | 0.053 | 0.053 | 0.063 | 0.063 |
| *log($inc_j$)* | 1.865*** | 1.704*** | 1.528*** | 1.542*** | 1.663*** | 1.665*** | 1.833*** | 1.689*** |
| | 0.187 | 0.150 | 0.248 | 0.227 | 0.235 | 0.217 | 0.177 | 0.150 |
| *Log ($dist_{ij}$)* | -0.233*** | -0.249*** | -0.082* | -0.08* | -0.099** | -0.098** | -0.211*** | -0.221*** |
| | 0.053 | 0.052 | 0.051 | 0.051 | 0.053 | 0.053 | 0.050 | 0.049 |
| *Intra_const* | -4.649*** | -4.894*** | -2.98** | -2.968** | -3.992*** | -4.019*** | -2.742* | -2.864* |
| | 1.853 | 1.860 | 1.692 | 1.659 | 1.662 | 1.700 | 1.932 | 2.434 |
| *Intra_gdp* | 1.177*** | 1.196*** | 1.165*** | 1.16*** | 1.136*** | 1.137*** | 1.176*** | 1.186*** |
| | 0.109 | 0.110 | 0.097 | 0.093 | 0.096 | 0.098 | 0.104 | 0.106 |
| *log($m_{ij}$)* | 0.133*** | | 0.257*** | | 0.223*** | | 0.175*** | |
| | 0.038 | | 0.046 | | 0.046 | | 0.04 | |
| *log($m_{ji}$)* | 0.241*** | | 0.237*** | | 0.225*** | | 0.269*** | |
| | 0.041 | | 0.047 | | 0.049 | | 0.041 | |
| *$Mig\_net_{ij}$* | | 0.185*** | | 0.247*** | | 0.224*** | | 0.221*** |
| | | 0.017 | | 0.019 | | 0.018 | | 0.019 |
| *P* | 0.008 | 0.007 | -0.157*** | -0.154*** | -0.055*** | -0.056*** | -0.199*** | -0.206*** |
| | 0.019 | 0.020 | 0.047 | 0.047 | 0.023 | 0.021 | 0.065 | 0.062 |
| *$\theta$* | 0.77*** | 0.798*** | 0.901*** | 0.894*** | 0.861*** | 0.854*** | 0.879*** | 0.895*** |
| | 0.067 | 0.057 | 0.034 | 0.035 | 0.041 | 0.037 | 0.053 | 0.050 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables are averages in the period 2000-2009.

Now it is interesting to focus on the results reported in **Table 4.7** for each of the alternative SAC specifications and the two preferred models M10 and M12. The first feature to note is the strong similarity between M10 and M12 in the four cases. In addition it is important to take notice that the spatial and network effects appear to be significant for all the models and specifications with the exception of the spatial effects in the dependent variable for M10 and M12 in SAC-I. Surprisingly, the spatial lag of the

dependent variable in SAC-II-III and IV is significant but negative, that is, the opposite sign that the one found in the SAR specifications. To this regard, it is worth mentioning that the negative coefficient for this element in SAC-III is very low (M10:-0.099; M12: -0.098) compared to the one on SAC-II and SAC-III when the spatial lag is based on the "network" (demographic structure).i.e: SAC-II-M10:- -0.157; SAC-II-M12: -0.206. Another remarkable difference is found on the log of distance: when the trade flows are modelled in the SAC-I and the SAC-IV version of equation (7), which both have in common the use of $W^{net}$ on the disturbance term, the negative coefficient is around -0.2, that is, a value that is close to the one obtained for M12 in the SAR specification. However, the negative value of distance in SAC-II and SAC-III, that is, when $W^{spa}$ is used for the disturbance term, drops to -0.08 or -0.09, reaching the smallest values of all the specifications tested in this article. However, the rest of the coefficients -even the ones referred to migration effects- remain almost invariant in the four alternative specifications.

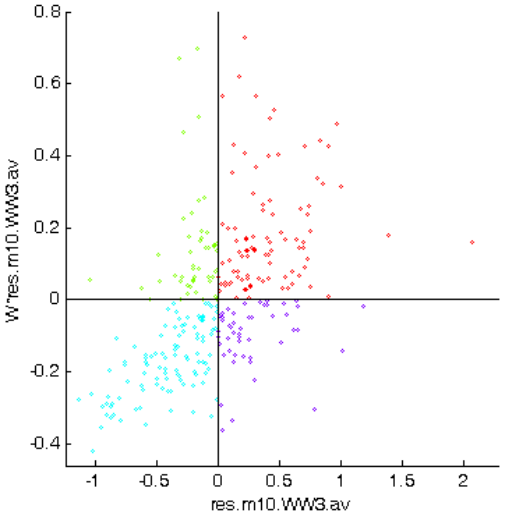
Finally, in **Figure 4.6** we plot the scatterplots for the residuals obtained in M10 using the SAR, SAC-I-IV estimation procedures, using a row normalized weight matrix obtained as a sum of all of the weight matrices described here ($W_3 = W^{spa} + W^{net}$)[31]. The use of such approach is an attempt to show in a single picture if after using these 5 spatial models the residuals still show a significant association with a lag based on spatial and demographic structure. The interpretation is like the one in **Figure 4.4.** Based on these graphs, just the scatter plot for the first quadrant (M10-SAR) -and less clear for the M10-SAC-I and the M10-SAC-IV- still shows a positive relation. This result can be interpreted as if the SAC specifications –specially SAC-II and SAC-III- did a better job on eliminating all the positive association between the residuals and the spatial and demographic lags plotted **in Figure 4.4** and in **Figure 4.5**. This is coherent with the largest spatial autocorrelation effects found along this article for the network effect and the disturbance term. For further research, it would be interesting to analyse more in detail to what extent this results vary with alternative weight matrices for the same relations, such as, for example, using inverse distance for the spatial effects, and a dichotomy weight matrix for demography, based on certain thresholds.

The results obtained for each specific year in the sample (2000-2009) are coherent with the ones analysed here using the average figures. For brevity, just the main results for 2000 and 2009 are showed in the Appendix.

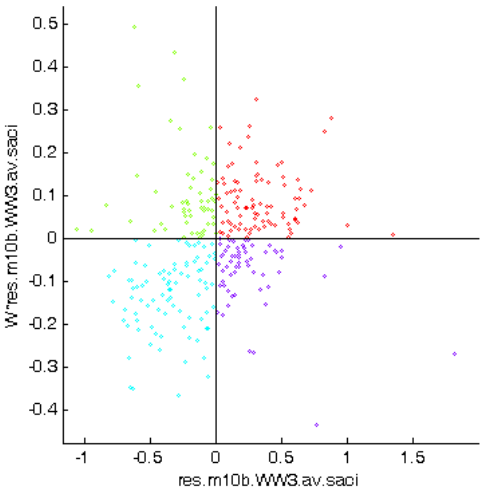
[31] The scatterplots for the residuals of each model and weight matrices are available upon request.

**Figure 4.6. I-Moran Scatterplot on residuals from SAR and SAC estimates. Y = Residuals from M10. ($W_3$= $W^{spa}$ + $W^{net}$).**

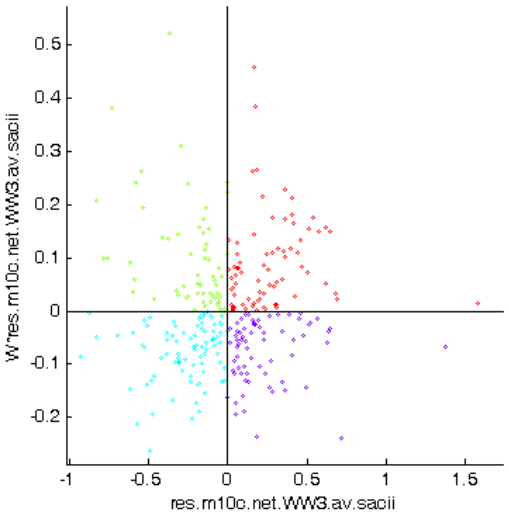
M10-SAR



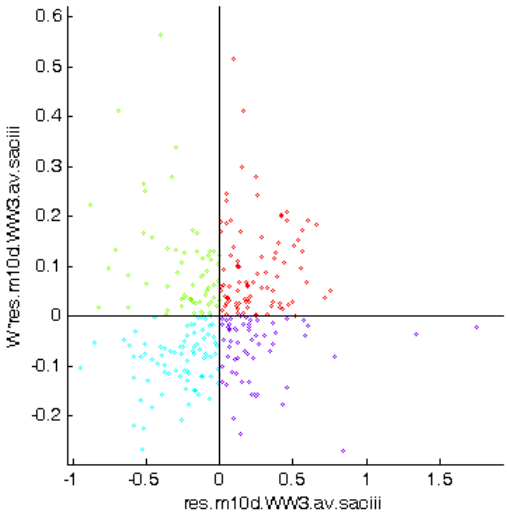

M10-SAC-I



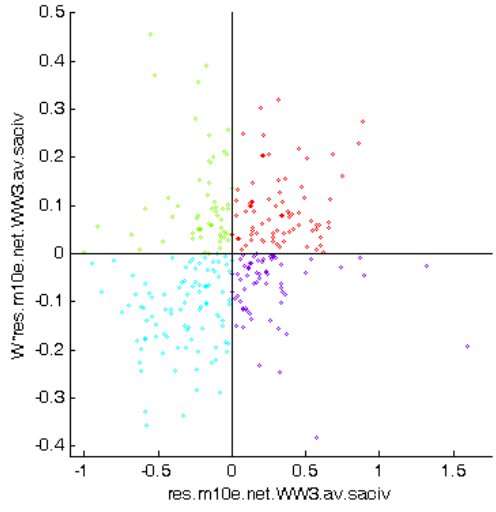

M10-SAC-II




M10-SAC-III




M10-SAC-IV



## 4.5. Conclusions

In this article we analyse the relation between interregional trade of service and social networks. We also consider whether interregional trade flows in services linked with tourism exhibit spatial and/or social network dependence. Conventional empirical gravity models assume the magnitude of bilateral flows between regions are independent of flows to/from regions located nearby in space, or flows to/from regions related through social/cultural/ethic network connections.

We provide an extended empirical specification that relaxes the assumption of independence between bilateral flows which is inherent in any least-squares regression. Our argument is that bilateral flows between an exporting region *i* and an exporting region *j* may exhibit dependence on: 1) flows to regions that are spatially near the exporting and importing regions *i* and *j* (spatial dependence), and 2) flows to regions that are socially/demographically "related" to the exporting and importing regions *i* and *j*. A spatial weight matrix elaborated in the way suggested by LeSage and Pace (2008) was used to quantify the spatial structure of connectivity between regions involved in bilateral flows. A novel social network matrix was constructed using information on the bilateral stock of interregional migrants between the 17 Spanish regions.

Estimates from a set of nested models show evidence of statistically significant spatial and network (demographic) dependence in the bilateral flows of trade in services considered. The analysis has been applied to average data for the period 2000-2009, as well as for each single year, finding robust results time wise. The significant social network dependence can be interpreted as an indication that people exhibit preferences for destinations in or near their home-land regions, or destination regions in or near where co-nationals have settled heavily. Significant spatial dependence is an indication that people consider intervening opportunities taking the form of visits to regions nearby the origin of their vacation trip, as well as competing destinations, represented by regions nearby the destination trip.

One finding of interest is that introduction of explanatory variables that control for the stock of emigrants and immigrants as well as spatial and network dependence (and the conventional measures of origin and destination economic size) results in a low coefficient estimate for bilateral distance between origin and destination regions. This suggests that cultural/social as well as intervening opportunities and competing destinations considerations maybe exert an important enough influence on destination trip decisions

to overcome the traditional resistance role played by distance that typically diminishes the magnitude of bilateral flows.

Departing from these results, a number of extensions could be considered in the future agenda. First, it is convenient to explore alternative specifications of spatial models such as the SLX. Then, based on Fischer and Griffith, (2008), it will be interesting to explore the sensibility of the results obtained here with the ones that could be obtained through the combination of spatial filtering techniques and PPML estimators. Finally, although such routines are still being developed, our current analysis could be enriched by considering the dynamic dimension exploiting the panel data and including the spatial autocorrelation effects.

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http://www.freit.org/WorkingPapers/Papers/Immigration/FREIT277.pdfm ).

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# 4.7. Appendix 1. Complete results for SAC-I to SAC-IV

**Table 4.7. Spatial General Model. SAC-I ($W_1$=spatial; $W_2$=demographic)**
Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.

| | M7 | M8 | M9 | M10 | M11 | M12 | M13 |
|---|---|---|---|---|---|---|---|
| *Pseudo $R^2$* | 0.929 | 0.947 | 0.948 | 0.951 | 0.946 | 0.951 | 0.946 |
| *Rbar²* | 0.927 | 0.946 | 0.947 | 0.950 | 0.945 | 0.950 | 0.945 |
| *Sigma 2* | 0.230 | 0.172 | 0.168 | 0.158 | 0.174 | 0.158 | 0.176 |
| *N. Draws* | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| *N. Omitted* | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| *Const* | -30.288*** | -23.621*** | -30.943*** | -27.551*** | -29.196*** | -26.25*** | -26.109*** |
| | 1.847 | 1.771 | 1.562 | 1.840 | 1.978 | 1.554 | 2.453 |
| *log($gva_i$)* | 0.832*** | 0.756*** | 0.511*** | 0.56*** | 0.513*** | 0.6*** | 0.605*** |
| | 0.039 | 0.038 | 0.046 | 0.049 | 0.051 | 0.040 | 0.046 |
| *log($pop_j$)* | 0.986*** | 0.655*** | 0.697*** | 0.623*** | 0.695*** | 0.613*** | 0.685*** |
| | 0.054 | 0.064 | 0.055 | 0.058 | 0.060 | 0.058 | 0.064 |
| *log($inc_j$)* | 1.691*** | 1.278*** | 2.206*** | 1.865*** | 2.005*** | 1.704*** | 1.622*** |
| | 0.176 | 0.169 | 0.159 | 0.187 | 0.197 | 0.150 | 0.164 |
| *Log ($dist_{ij}$)* | -0.495*** | -0.332*** | -0.232*** | -0.233*** | -0.21*** | -0.249*** | -0.252*** |
| | 0.054 | 0.051 | 0.053 | 0.053 | 0.053 | 0.052 | 0.051 |
| *Intra_const* | -2.527 | -4.857*** | -4.01** | -4.649*** | -4.175** | -4.894*** | -4.642** |
| | 2.215 | 1.935 | 1.927 | 1.853 | 1.996 | 1.860 | 2.596 |
| *Intra_gdp* | 1.092*** | 1.213*** | 1.135*** | 1.177*** | 1.136*** | 1.196*** | 1.179*** |
| | 0.130 | 0.115 | 0.114 | 0.109 | 0.117 | 0.110 | 0.118 |
| *log($m_{ij}$)* | | 0.286*** | | 0.133*** | 0.052* | | |
| | | 0.032 | | 0.038 | 0.037 | | |
| *log($m_{ji}$)* | | | 0.331*** | 0.241*** | 0.287*** | | |
| | | | 0.032 | 0.041 | 0.040 | | |
| *Mig_$net_{ij}$* | | | | | | 0.185*** | 0.162*** |
| | | | | | | 0.017 | 0.018 |
| *ρ (spatial)* | 0.034* | 0.008 | 0.014 | 0.008 | 0.021 | 0.007 | 0.024 |
| | 0.022 | 0.021 | 0.020 | 0.019 | 0.019 | 0.020 | 0.021 |
| *θ(demo)* | 0.704*** | 0.854*** | 0.703*** | 0.77*** | 0.752*** | 0.798*** | 0.843*** |
| | 0.076 | 0.052 | 0.074 | 0.067 | 0.082 | 0.057 | 0.069 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables are averages in the period 2000-2009.

**Table 4.8. Spatial General Model. SAC-II (W1= demographic; W2= spatial)**
Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.

| | M7 | M8 | M9 | M10 | M11 | M12 | M13 |
|---|---|---|---|---|---|---|---|
| *Pseudo $R^2$* | 0.939 | 0.962 | 0.957 | 0.964 | 0.962 | 0.964 | 0.962 |
| *Rbar²* | 0.938 | 0.961 | 0.956 | 0.963 | 0.961 | 0.963 | 0.961 |
| *Sigma 2* | 0.198 | 0.124 | 0.138 | 0.117 | 0.124 | 0.117 | 0.123 |
| *N. Draws* | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| *N. Omitted* | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| *Const* | -31.987*** | -20.838*** | -28.62*** | -22.692*** | -24.047*** | -22.846*** | -24.239*** |
| | 2.576 | 2.456 | 2.320 | 2.545 | 2.556 | 2.392 | 2.333 |
| *log($gva_i$)* | 0.823*** | 0.615*** | 0.524*** | 0.519*** | 0.518*** | 0.516*** | 0.516*** |
| | 0.042 | 0.039 | 0.045 | 0.042 | 0.043 | 0.041 | 0.042 |
| *log($pop_j$)* | 0.954*** | 0.647*** | 0.641*** | 0.576*** | 0.577*** | 0.575*** | 0.576*** |
| | 0.051 | 0.052 | 0.052 | 0.052 | 0.054 | 0.053 | 0.054 |
| *log($inc_j$)* | 1.731*** | 1.166*** | 2.022*** | 1.528*** | 1.573*** | 1.542*** | 1.593*** |
| | 0.254 | 0.234 | 0.225 | 0.248 | 0.249 | 0.227 | 0.228 |
| *Log ($dist_{ij}$)* | -0.319*** | -0.124** | -0.106** | -0.082* | -0.078* | -0.08* | -0.076* |
| | 0.061 | 0.053 | 0.055 | 0.051 | 0.052 | 0.051 | 0.052 |
| *Intra_const* | -5.928*** | -3.968*** | -3.293** | -2.98** | -3.95** | -2.968** | -3.998*** |
| | 2.105 | 1.714 | 1.757 | 1.692 | 1.695 | 1.659 | 1.644 |
| *Intra_gdp* | 1.178*** | 1.207*** | 1.129*** | 1.165*** | 1.151*** | 1.16*** | 1.152*** |
| | 0.123 | 0.099 | 0.102 | 0.097 | 0.103 | 0.093 | 0.099 |
| *log($m_{ij}$)* | | 0.408*** | | 0.257*** | 0.238*** | | |
| | | 0.035 | | 0.046 | 0.048 | | |
| *log($m_{ji}$)* | | | 0.406*** | 0.237*** | 0.223*** | | |
| | | | 0.039 | 0.047 | 0.048 | | |
| *$Mig\_net_{ij}$* | | | | | | 0.247*** | 0.23*** |
| | | | | | | 0.019 | 0.019 |
| *ρ (demo)* | 0.113** | -0.124*** | -0.09** | -0.157*** | -0.061 | -0.154*** | -0.058 |
| | 0.051 | 0.049 | 0.054 | 0.047 | 0.046 | 0.047 | 0.044 |
| *θ (spatial)* | 0.739*** | 0.921*** | 0.807*** | 0.901*** | 0.873*** | 0.894*** | 0.872*** |
| | 0.068 | 0.026 | 0.059 | 0.034 | 0.042 | 0.035 | 0.042 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables are averages in the period 2000-2009.

**Table 4.9. Spatial General Model. SAC-III (W1= W2= spatial)**
Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.

| | M7 | M8 | M9 | M10 | M12 |
|---|---|---|---|---|---|
| *Pseudo $R^2$* | 0.939 | 0.961 | 0.957 | 0.962 | 0.962 |
| *Rbar$^2$* | 0.938 | 0.960 | 0.956 | 0.961 | 0.961 |
| *Sigma 2* | 0.196 | 0.128 | 0.139 | 0.122 | 0.122 |
| *N. Draws* | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| *N. Omitted* | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| *Const* | -31.262*** | -22.638*** | -29.123*** | -24.746*** | -24.74*** |
| | 2.596 | 2.389 | 2.187 | 2.328 | 2.200 |
| *log($gva_i$)* | 0.861*** | 0.607*** | 0.515*** | 0.513*** | 0.513*** |
| | 0.038 | 0.039 | 0.044 | 0.042 | 0.041 |
| *log($pop_j$)* | 1.007*** | 0.63*** | 0.632*** | 0.564*** | 0.562*** |
| | 0.046 | 0.052 | 0.052 | 0.053 | 0.053 |
| *log($inc_j$)* | 1.691*** | 1.302*** | 2.068*** | 1.663*** | 1.665*** |
| | 0.258 | 0.231 | 0.219 | 0.235 | 0.217 |
| *Log ($dist_{ij}$)* | -0.346*** | -0.136*** | -0.126** | -0.099** | -0.098** |
| | 0.062 | 0.054 | 0.055 | 0.053 | 0.053 |
| *Intra_const* | -5.732*** | -4.786*** | -3.843** | -3.992*** | -4.019*** |
| | 2.109 | 1.731 | 1.783 | 1.662 | 1.700 |
| *Intra_gdp* | 1.255*** | 1.185*** | 1.126*** | 1.136*** | 1.137*** |
| | 0.121 | 0.100 | 0.104 | 0.096 | 0.098 |
| *log($m_{ij}$)* | | 0.376*** | | 0.223*** | |
| | | 0.033 | | 0.046 | |
| *log($m_{ji}$)* | | | 0.387*** | 0.225*** | |
| | | | 0.035 | 0.049 | |
| *$Mig\_net_{ij}$* | | | | | 0.224*** |
| | | | | | 0.018 |
| *ρ (demo)* | -0.03 | -0.053** | -0.051*** | -0.055*** | -0.056*** |
| | 0.024 | 0.023 | 0.021 | 0.023 | 0.021 |
| *θ (spatial)* | 0.774*** | 0.895*** | 0.773*** | 0.861*** | 0.854*** |
| | 0.055 | 0.028 | 0.053 | 0.041 | 0.037 |

*Note that in SAC-III, since the $W^{net}$ is not used, the difference between the models based on the rotated version of $W^{net'}$ are omitted (M11; M13).

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables are averages in the period 2000-2009.

**Table 4.10. Spatial General Model. SAC-IV (W1= W2= demographic)**
Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Average flows 2000-2009.

| | M7 | M8 | M9 | M10 | M11 | M12 | M13 |
|---|---|---|---|---|---|---|---|
| *Pseudo $R^2$* | 0.929 | 0.949 | 0.950 | 0.955 | 0.946 | 0.955 | 0.945 |
| *Rbar²* | 0.928 | 0.947 | 0.949 | 0.954 | 0.944 | 0.954 | 0.944 |
| *Sigma 2* | 0.229 | 0.166 | 0.163 | 0.147 | 0.176 | 0.146 | 0.178 |
| *N. Draws* | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| *N. Omitted* | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| *Const* | -31.147*** | -21.917*** | -30.282*** | -25.19*** | -30.135*** | -23.993*** | -26.864*** |
| | 1.864 | 2.048 | 1.601 | 1.920 | 2.162 | 2.284 | 2.250 |
| *log($gva_i$)* | 0.805*** | 0.766*** | 0.498*** | 0.548*** | 0.524*** | 0.583*** | 0.617*** |
| | 0.042 | 0.037 | 0.048 | 0.047 | 0.052 | 0.040 | 0.046 |
| *log($pop_j$)* | 0.949*** | 0.627*** | 0.696*** | 0.581*** | 0.701*** | 0.567*** | 0.696*** |
| | 0.054 | 0.068 | 0.055 | 0.063 | 0.059 | 0.063 | 0.064 |
| *log($inc_j$)* | 1.731*** | 1.221*** | 2.252*** | 1.833*** | 2.066*** | 1.689*** | 1.665*** |
| | 0.174 | 0.168 | 0.161 | 0.177 | 0.199 | 0.150 | 0.174 |
| *Log ($dist_{ij}$)* | -0.503*** | -0.323*** | -0.228*** | -0.211*** | -0.222*** | -0.221*** | -0.264*** |
| | 0.052 | 0.051 | 0.052 | 0.050 | 0.050 | 0.049 | 0.050 |
| *Intra_const* | -4.136** | -3.767** | -3.055* | -2.742* | -4.525** | -2.864* | -5.143*** |
| | 2.232 | 2.102 | 2.008 | 1.932 | 2.007 | 2.434 | 2.073 |
| *Intra_gdp* | 1.106*** | 1.217*** | 1.149*** | 1.176*** | 1.142*** | 1.186*** | 1.201*** |
| | 0.129 | 0.111 | 0.109 | 0.104 | 0.117 | 0.106 | 0.115 |
| *log($m_{ij}$)* | | 0.321*** | | 0.175*** | 0.043 | | |
| | | 0.036 | | 0.04 | 0.038 | | |
| *log($m_{ji}$)* | | | 0.364*** | 0.269*** | 0.285*** | | |
| | | | 0.037 | 0.041 | 0.041 | | |
| *$Mig\_net_{ij}$* | | | | | | 0.221*** | 0.158*** |
| | | | | | | 0.019 | 0.02 |
| *ρ (demo)* | 0.163*** | -0.116** | -0.104* | -0.199*** | 0.045 | -0.206*** | 0.031 |
| | 0.058 | 0.064 | 0.065 | 0.065 | 0.058 | 0.062 | 0.063 |
| *θ (spatial)* | 0.623*** | 0.901*** | 0.773*** | 0.879*** | 0.726*** | 0.895*** | 0.822*** |
| | 0.084 | 0.047 | 0.075 | 0.053 | 0.092 | 0.050 | 0.071 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables are averages in the period 2000-2009.

## 4.8. Appendix 2. Results by year

**2000**

**Table 4.11. Spatial Autoregressive Model**

Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Flows 2000.

| | M7 | M8 | M9 | M10 | M11 | M12 | M13 |
|---|---|---|---|---|---|---|---|
| *Pseudo $R^2$* | 0.910 | 0.911 | 0.920 | 0.921 | 0.920 | 0.914 | 0.911 |
| *Rbar²* | 0.908 | 0.909 | 0.918 | 0.918 | 0.918 | 0.912 | 0.908 |
| *Sigma 2* | 0.294 | 0.292 | 0.261 | 0.259 | 0.262 | 0.280 | 0.292 |
| *Log likelihood* | -640.773 | -639.517 | -622.930 | -621.812 | -623.141 | -633.117 | -639.097 |
| *Const* | -26.722*** | -25.642*** | -27.62*** | -28.826*** | -30.662*** | -25.231*** | -26.509*** |
| | -15.749 | -14.061 | -17.213 | -16.104 | -17.050 | -14.858 | -15.279 |
| *log($gva_i$)* | 0.708*** | 0.693*** | 0.537*** | 0.527*** | 0.548*** | 0.629*** | 0.688*** |
| | 22.277 | 20.394 | 11.556 | 11.287 | 11.676 | 15.495 | 16.588 |
| *log($pop_j$)* | 0.773*** | 0.727*** | 0.625*** | 0.649*** | 0.673*** | 0.651*** | 0.692*** |
| | 20.755 | 15.037 | 13.251 | 13.076 | 13.506 | 12.703 | 13.202 |
| *log($inc_j$)* | 1.404*** | 1.327*** | 1.746*** | 1.87*** | 2.004*** | 1.385*** | 1.425*** |
| | 9.211 | 8.339 | 11.326 | 10.735 | 11.453 | 9.313 | 9.378 |
| *Log ($dist_{ij}$)* | -0.387*** | -0.352*** | -0.177*** | -0.184*** | -0.187*** | -0.262*** | -0.276*** |
| | -8.631 | -6.995 | -3.146 | -3.280 | -3.312 | -4.73 | -4.886 |
| *Intra_const* | -1.432 | -1.496 | -2.044 | -2.042 | -1.777 | -1.74 | -1.415 |
| | -0.573 | -0.601 | -0.867 | -0.870 | -0.753 | -0.714 | -0.568 |
| *Intra_gdp* | 0.794*** | 0.793*** | 0.848*** | 0.85*** | 0.838*** | 0.813*** | 0.818*** |
| | 5.415 | 5.432 | 6.130 | 6.169 | 6.053 | 5.682 | 5.597 |
| *log($m_{ij}$)* | | 0.045 | | -0.046 | -0.073** | | |
| | | 1.593 | | -1.5 | -2.377 | | |
| *log($m_{ji}$)* | | | 0.233*** | 0.263*** | 0.29*** | | |
| | | | 6.593 | 6.519 | 7.174 | | |
| *$Mig\_net_{ij}$* | | | | | | 0.075*** | 0.072*** |
| | | | | | | 4.09 | 3.871 |
| *$\rho_1$ (spat)* | 0.111*** | 0.113*** | 0.085* | 0.082 | 0.107 | 0.105** | 0.151 |
| | 0.000 | 0.000 | 1.761 | 1.672 | 0.000 | 0.000 | 0.000 |
| *$\rho_2$ (demo)* | 0.662*** | 0.647*** | 0.464*** | 0.465*** | 0.448*** | 0.568*** | 0.476 |
| | 6.183 | 6.844 | 4.487 | 3.645 | 4.305 | 5.145 | 0.000 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables for year 2000.

**Table 4.12. Spatial General Model. SAC-IV (W1= W2= demographic)**
Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Flows 2000.

| | **SAC-I** | | **SAC-II** | | **SAC-III** | | **SAC-IV** | |
|---|---|---|---|---|---|---|---|---|
| | $W_1=W^{spa}$; $W_2=W^{net}$ | | $W_1= W^{net}$; $W_2= W^{spa}$ | | $W_1= W_2= W^{spa}$ | | $W_1= W_2= W^{net}$ | |
| | M10 | M12 | M10 | M12 | M10 | M12 | M10 | M12 |
| *Pseudo R²* | 0.948 | 0.948 | 0.961 | 0.961 | 0.962 | 0.962 | 0.955 | 0.955 |
| *Rbar²* | 0.946 | 0.946 | 0.960 | 0.960 | 0.961 | 0.961 | 0.954 | 0.954 |
| *Sigma 2* | 0.177 | 0.176 | 0.130 | 0.133 | 0.122 | 0.122 | 0.147 | 0.146 |
| *N. Draws* | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| *N. Omitted* | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| *Const* | -26.17*** | -25.70*** | -18.97*** | -20.41*** | -24.74*** | -24.74*** | -25.19*** | -23.99*** |
| | 1.775 | 5.532 | 2.481 | 2.324 | 2.328 | 2.200 | 1.920 | 2.284 |
| $log(gva_i)$ | 0.596*** | 0.612*** | 0.513*** | 0.49*** | 0.513*** | 0.513*** | 0.548*** | 0.583*** |
| | 0.053 | 0.042 | 0.045 | 0.043 | 0.042 | 0.041 | 0.047 | 0.040 |
| $log(pop_j)$ | 0.603*** | 0.596*** | 0.496*** | 0.496*** | 0.564*** | 0.562*** | 0.581*** | 0.567*** |
| | 0.065 | 0.064 | 0.052 | 0.054 | 0.053 | 0.053 | 0.063 | 0.063 |
| $log(inc_j)$ | 1.743*** | 1.682*** | 1.299*** | 1.466*** | 1.663*** | 1.665*** | 1.833*** | 1.689*** |
| | 0.191 | 0.144 | 0.242 | 0.222 | 0.235 | 0.217 | 0.177 | 0.150 |
| $Log\ (dist_{ij})$ | -0.245*** | -0.248*** | -0.089** | -0.084* | -0.099** | -0.098** | -0.211*** | -0.221*** |
| | 0.056 | 0.055 | 0.054 | 0.054 | 0.053 | 0.053 | 0.050 | 0.049 |
| *Intra_const* | -4.936*** | -5.066*** | -2.606* | -2.528* | -3.992*** | -4.019*** | -2.742* | -2.864* |
| | 1.890 | 5.790 | 1.742 | 1.707 | 1.662 | 1.700 | 1.932 | 2.434 |
| *Intra_gdp* | 1.202*** | 1.21*** | 1.164*** | 1.153*** | 1.136*** | 1.137*** | 1.176*** | 1.186*** |
| | 0.115 | 0.115 | 0.100 | 0.099 | 0.096 | 0.098 | 0.104 | 0.106 |
| $log(m_{ij})$ | 0.167*** | | 0.336*** | | 0.223*** | | 0.175*** | |
| | 0.042 | | 0.048 | | 0.046 | | 0.04 | |
| $log(m_{ji})$ | 0.21*** | | 0.185*** | | 0.225*** | | 0.269*** | |
| | 0.045 | | 0.050 | | 0.049 | | 0.041 | |
| $Mig\_net_{ij}$ | | 0.188*** | | 0.263*** | | 0.224*** | | 0.221*** |
| | | 0.018 | | 0.02 | | 0.018 | | 0.019 |
| $\rho$ | 0.009 | 0.008 | -0.176*** | -0.17*** | -0.055*** | -0.056*** | -0.199*** | -0.206*** |
| | 0.021 | 0.021 | 0.051 | 0.051 | 0.023 | 0.021 | 0.065 | 0.062 |
| $\theta$ | 0.875*** | 0.886*** | 0.927*** | 0.916*** | 0.861*** | 0.854*** | 0.879*** | 0.895*** |
| | 0.052 | 0.052 | 0.025 | 0.027 | 0.041 | 0.037 | 0.053 | 0.050 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables for year 2000.

**2009**

**Table 4.13. Spatial Autoregressive Model**

Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Flows 2009.

| | M7 | M8 | M9 | M10 | M11 | M12 | M13 |
|---|---|---|---|---|---|---|---|
| *Pseudo $R^2$* | 0.904 | 0.909 | 0.923 | 0.923 | 0.925 | 0.918 | 0.919 |
| *Rbar$^2$* | 0.902 | 0.907 | 0.921 | 0.921 | 0.922 | 0.916 | 0.917 |
| *Sigma 2* | 0.310 | 0.294 | 0.249 | 0.248 | 0.244 | 0.265 | 0.263 |
| *Log likelihood* | -648.034 | -640.068 | -615.309 | -614.577 | -612.473 | -624.336 | -623.554 |
| *Const* | -31.465*** | -28.92*** | -30.701*** | -29.988*** | -31.011*** | -28.202*** | -29.306*** |
| | -15.279 | -13.767 | -16.616 | -15.500 | -16.156 | -14.443 | -15.056 |
| *log($gva_i$)* | 0.752*** | 0.701*** | 0.526*** | 0.525*** | 0.527*** | 0.593*** | 0.612*** |
| | 22.316 | 19.147 | 11.574 | 11.564 | 11.716 | 13.977 | 14.465 |
| *log($pop_j$)* | 0.833*** | 0.717*** | 0.639*** | 0.616*** | 0.618*** | 0.613*** | 0.624*** |
| | 21.819 | 14.606 | 13.968 | 12.494 | 12.621 | 12.055 | 12.312 |
| *log($inc_j$)* | 1.753*** | 1.61*** | 2.047*** | 1.988*** | 2.054*** | 1.72*** | 1.779*** |
| | 9.519 | 8.830 | 12.147 | 11.355 | 11.824 | 10.110 | 10.492 |
| *Log ($dist_{ij}$)* | -0.398*** | -0.31*** | -0.142*** | -0.131** | -0.139*** | -0.184*** | -0.193*** |
| | -8.565 | -6.099 | -2.683 | -2.456 | -2.624 | -3.427 | -3.599 |
| *Intra_const* | -1.616 | -1.836 | -2.561 | -2.582 | -2.411 | -2.284 | -2.108 |
| | -0.611 | -0.713 | -1.081 | -1.093 | -1.028 | -0.936 | -0.866 |
| *Intra_gdp* | 0.848*** | 0.859*** | 0.959*** | 0.957*** | 0.919*** | 0.908*** | 0.884*** |
| | 5.629 | 5.859 | 7.099 | 7.108 | 6.875 | 6.527 | 6.373 |
| *log($m_{ij}$)* | | 0.124*** | | 0.037 | 0.024 | | |
| | | 4.096 | | 1.211 | 0.793 | | |
| *log($m_{ji}$)* | | | 0.323*** | 0.304*** | 0.301*** | | |
| | | | 9.449 | 8.157 | 8.116 | | |
| *Mig_net$_{ij}$* | | | | | | 0.142*** | 0.135*** |
| | | | | | | 7.566 | 7.215 |
| *$\rho_1$ (spat)* | 0.1** | 0.095* | 0.05 | 0.049 | 0.053* | 0.071 | 0.083* |
| | 0.000 | 1.933 | 0.000 | 0.000 | 0.000 | 1.518 | 1.833 |
| *$\rho_2$ (demo)* | 0.535*** | 0.479*** | 0.216** | 0.217** | 0.315*** | 0.336** | 0.383** |
| | 5.423 | 3.621 | 2.153 | 2.166 | 2.992 | 2.295 | 2.530 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables for year 2009.

**Table 4.14. Spatial General Model. SAC-IV (W1= W2= demographic)**
Dependent variable: Interregional monetary flows of Accommodation, Restaurants and Travel Agencies. Flows 2009.

| | **SAC-I** | | **SAC-II** | | **SAC-III** | | **SAC-IV** | |
|---|---|---|---|---|---|---|---|---|
| | $W_1=W^{spa}$; $W_2=W^{net}$ | | $W_1= W^{net}$; $W_2= W^{spa}$ | | $W_1= W_2= W^{spa}$ | | $W_1= W_2= W^{net}$ | |
| | M10 | M12 | M10 | M12 | M10 | M12 | M10 | M12 |
| *Pseudo R²* | 0.942 | 0.942 | 0.954 | 0.954 | 0.962 | 0.962 | 0.955 | 0.955 |
| *Rbar²* | 0.940 | 0.940 | 0.953 | 0.953 | 0.961 | 0.961 | 0.954 | 0.954 |
| *Sigma 2* | 0.195 | 0.194 | 0.152 | 0.152 | 0.122 | 0.122 | 0.147 | 0.146 |
| *N. Draws* | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 | 5,500 |
| *N. Omitted* | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| *Const* | -28.31*** | -27.55*** | -23.03*** | -23.05*** | -24.74*** | -24.74*** | -25.19*** | -23.99*** |
| | 2.002 | 1.890 | 2.815 | 2.641 | 2.328 | 2.200 | 1.920 | 2.284 |
| $log(gva_i)$ | 0.591*** | 0.616*** | 0.546*** | 0.545*** | 0.513*** | 0.513*** | 0.548*** | 0.583*** |
| | 0.053 | 0.046 | 0.049 | 0.046 | 0.042 | 0.041 | 0.047 | 0.040 |
| $log(pop_j)$ | 0.641*** | 0.633*** | 0.615*** | 0.613*** | 0.564*** | 0.562*** | 0.581*** | 0.567*** |
| | 0.065 | 0.063 | 0.059 | 0.059 | 0.053 | 0.053 | 0.063 | 0.063 |
| $log(inc_j)$ | 1.87*** | 1.778*** | 1.466*** | 1.474*** | 1.663*** | 1.665*** | 1.833*** | 1.689*** |
| | 0.200 | 0.176 | 0.265 | 0.244 | 0.235 | 0.217 | 0.177 | 0.150 |
| $Log\ (dist_{ij})$ | -0.276*** | -0.287*** | -0.132** | -0.133** | -0.099** | -0.098** | -0.211*** | -0.221*** |
| | 0.059 | 0.056 | 0.059 | 0.058 | 0.053 | 0.053 | 0.050 | 0.049 |
| *Intra_const* | -5.128*** | -5.135*** | -3.522** | -3.503** | -3.992*** | -4.019*** | -2.742* | -2.864* |
| | 2.119 | 2.083 | 1.926 | 1.930 | 1.662 | 1.700 | 1.932 | 2.434 |
| *Intra_gdp* | 1.218*** | 1.221*** | 1.207*** | 1.207*** | 1.136*** | 1.137*** | 1.176*** | 1.186*** |
| | 0.124 | 0.121 | 0.110 | 0.109 | 0.096 | 0.098 | 0.104 | 0.106 |
| $log(m_{ij})$ | 0.158*** | | 0.258*** | | 0.223*** | | 0.175*** | |
| | 0.043 | | 0.055 | | 0.046 | | 0.04 | |
| $log(m_{ji})$ | 0.232*** | | 0.255*** | | 0.225*** | | 0.269*** | |
| | 0.045 | | 0.054 | | 0.049 | | 0.041 | |
| $Mig\_net_{ij}$ | | 0.193*** | | 0.257*** | | 0.224*** | | 0.221*** |
| | | 0.019 | | 0.022 | | 0.018 | | 0.019 |
| $\rho$ | 0.008 | 0.007 | -0.164*** | -0.166*** | -0.055*** | -0.056*** | -0.199*** | -0.206*** |
| | 0.021 | 0.020 | 0.053 | 0.053 | 0.023 | 0.021 | 0.065 | 0.062 |
| $\theta$ | 0.738*** | 0.753*** | 0.847*** | 0.842*** | 0.861*** | 0.854*** | 0.879*** | 0.895*** |
| | 0.072 | 0.060 | 0.050 | 0.046 | 0.041 | 0.037 | 0.053 | 0.050 |

Source: Own elaboration. T statistics below the coefficients. Significance:. *** p<0.01, ** p<0.05, * p<0.1. All variables for year 2009.

# 5. The pro-trade effect of migration through the home bias effect in the standard intraindustry trade model

## 5.1. Introduction

There is a large body of research analyzing the pro-trade creation effect of social networks (ties or links) measured as the stock of migrants. Immigrant links to the home country include knowledge of home-country markets, language, preferences and business contacts. Two mechanisms have been mainly described in the literature to explain the link between migration and trade. First, immigrants bring along foreign market information and contacts that lower the transactions costs of trade; and second, immigrants present a preference bias towards home-country products. The first mechanism predicts a direct increase in both export and import flows between the host and home countries through a decrease in transactions costs associated with obtaining foreign market information and establishing trade relationships. The second mechanism suggests that immigrants' consumption of their home-country products will result in a direct increase in the host country's imports of these goods.

Although this has been broadly analyzed empirically (Gould, 1994; Head and Ries, 1998; Dunlevy and Hutchinson, 1999, 2001; Girma and Yu, 2002; Rauch and Trindade, 2002; Combes et al., 2005; White, 2007, among others), there is not a proper theoretical framework that illustrates both mechanisms described in the literature. The reduction on information costs as one part of the transaction costs has been included in the theoretical approximations presented in Gould (1994) or Combes et al. (2005). However, none of these works have made the effort to consider that if a taste effect in favor for homeland products exists, firms enjoy a certain level of market power in each market linked to the higher willingness to pay of emigrants. This influences firms' pricing strategy since the willingness to pay of the representative consumer will depend on the structure of the population, both in the firms' home countries and foreign markets. In this framework, the place where the firm is located (place where the variety is produced) became an additional characteristic of the product that consumers valued differently depending of their countries of origin and residence (Armington, 1969).

Departing from this situation, in this chapter we propose a framework in which the price that firms set in each country—domestic and foreign, along with their respective quantities, depend on the willingness to pay of the representative consumer in each market. So, the price set in any regime (with price discrimination or uniform pricing) and the quantity sold depends on the demographic structure of the economy. This fact has been avoided in the literature as well as in the analytical model developed in Gould (1994).

Following the literature suggesting that individuals have a certain preference for their homeland products, consumers exhibit a higher willingness to pay as a result of what we term the *homesickness effect*. In addition, as it seems reasonable that for long term migration, once an individual resides in a host country, she develops a taste for the way of life and products of that economy. Then, when one person migrates, although the willingness to pay for the products from the host country was originally lower when residing in her home country, it increases and gets closer to the one observed for the natives of the country (a *blending effect*). As a consequence, once one person migrates its willingness to pay increases, both for the varieties from her homeland and for the varieties from the host country. In the global economy, it turns out that the existence of scale economies and a monopolistic competition market structure, results in larger quantities that allow meeting this increased demand, with simultaneous price reductions which end up in larger social welfare.

In a sense, the attractiveness of the model relies on its rather simple mechanics. The results from the model show that if a 'taste effect' for homeland products exists, the increment of crossed migration flows results in larger bilateral trade at the expense of domestic production, i.e., quantities produced for the foreign markets (exports and imports) increase, thereby confirming the pro-trade effect of migration. As a net result of competition between firms exploiting scale economies (an effect driving prices down) and demand increases (driving prices up), even with increasingly produced quantities, price reduces as a consequence of the monopolistic competition framework, with the fall being larger, the larger the share of immigrants in the local market where the firm operates. Contemporarily, this results in fewer number of firms in each country but larger in the world economy, implying that the number of varieties accessible to consumers increases. In terms of social welfare analysis, a relevant result is obtained when we assume that individuals are symmetric in preferences, countries are of equal sizes and migrations flows are symmetric, i.e., the representative consumers across countries are the same. This is, contrary to the standard intra-industry model of homogenous consumers where migration flows do not affect to the characteristics of the representative consumer, if individuals present different willingness to pay for products depending on the country of origin and residence, opening countries to trade is detrimental to welfare when the stocks of immigrants and emigrants are small.

The chapter is structured as follows. In section 2, the model for the close economies in autarky is introduced. This constitutes our base model or benchmark against which we compare the results for the open economy. In section 3, we introduce the case where economies are open. In this section firms are allowed to practice price discrimination and set different prices in each country. In section 4, the situation where firms must charge a single uniform price to each type of consumer, independently of the country of residence, is presented. In each of these sections the quantities, prices and the number of firms in the short run and long run equilibria are analytically obtained. In addition, in each section the equilibrium values are summarized in terms of social welfare. Finally, section 5 concludes.

## 5.2. The close economy: demand and demography.

For a given set of $m = 1,..., i, j,..., M$ countries, the first situation to be analyzed is the case when trade does not exist, and therefore the demand for products in a given country $j$ is that corresponding to the domestic demand. However, we will assume that in country $j$

there are two types of consumers: immigrants originating from other countries and natives. According to the hypothesis that individuals have a special preference for the products from the homeland, these two types of consumers will have different demands as a consequence of the differences in their utility functions.

### 5.2.1. Individual and aggregate demand

On the one hand the natives will have a higher demand based on a preference for the products from their home-land. This type of consumers will represent a share of $1-\lambda_j$ of the total population living in *j*. On the other hand, immigrants in *j* from any other country *i* will have a lower demand. This will be a proportion of $\lambda_j$ over the population living in *j*. In case of more than two countries, $\lambda_j$ becomes the aggregate proportion of *j*'s total demand corresponding to immigrants, i.e., $\lambda_j = \sum_{i \neq j} \lambda_i$ .

Then, in country *j* we will have different demands for each type of consumers depending on the place of origin (home land) of the individual. Immigrants from each country *i* living in *j* have a linear demand function as

$$q_{ij}^j = v_{ij}^j - p_{ij}^j, i = 1,..., M-1, \quad (1)$$

where $q_{ij}^j$ represents the demand for products produced in *j* (superscripts refer to production or supply variables) by people who were born in *i* but live in *j* (first and second subscripts, respectively, referring to demographic and demands variables), $v_{ij}^j$ is the parameter capturing the reservation price–willingness to pay–of people born in *i* living in *j* for products provided by a firm in *j*, and $p_{ij}^j$ is the corresponding price. In a multi-country setting, a similar demand is assumed for the immigrants in *j* from any other country different from *j*.

Similarly, the demand function of country *j*'s natives is:

$$q_{jj}^j = v_{jj}^j - p_{jj}^j, j = 1,..., M. \quad (2)$$

This demand represents a proportion of $1-\lambda_j$ of the total demand of residents in *j* from products from *j*, with $\lambda_j = \sum_{i \neq j} \lambda_i$ representing the aggregate share of immigrants in *j* from any other country *i* as anticipated.

Then, the demand in country *j* of a product produced by a firm in country *j* will be:

$$q_j^j = S_j\left(1-\lambda_j\right)\left(v_{jj}^j / N^j - (p_{jj}^j - \overline{p}_{jj}^j)\right) + S_j \sum_{i \neq j} \lambda_i \left((v_{ij}^j / N^j - (p_{ij}^j - \overline{p}_{ij}^j)\right), j = 1, ..., M. \quad (3)$$

where we differentiate the price charged by a single firm: $p_{jj}^j, p_{ij}^j$, and the—average—price of the remaining firms: $\overline{p}_{jj}^j, \overline{p}_{ij}^j$. In this expression $v_{jj}^j > v_{jj}^i$ —natives have a willingness to pay for home products larger than immigrants— and $0 \leq \lambda_j \leq 1$. Moreover, if we further assume that the willingness to pay of consumers born in any country different from *j* is the same: $v_{ij}^j = v_{kj}^j, \forall i,k \neq j$, we could simplify the above expression in the following way: $q_j^j = S_j\left(1-\lambda_j\right)\left(v_{jj}^j / N^j - (p_{jj}^j - \overline{p}_{jj}^j)\right) + S_j\lambda_j\left(v_{ij}^j / N^j - (p_{ij}^j - \overline{p}_{ij}^j)\right)$. It will be assumed that firms cannot discriminate prices within a country (i.e., price natives and immigrants differently), so they serve every type of consumer residing in *j*—single subscript—at the same price: $p_{jj}^j = p_{ij}^j = p_j^j$ and $\overline{p}_{jj}^j = \overline{p}_{ij}^j = \overline{p}_j^j$ [32]. Consequently, firm's individual market demand simplifies to

$$q_j^j = S_j\left(\left(\left(1-\lambda_j\right)v_{jj}^j + \sum_{i \neq j} \lambda_i v_{ij}^j\right) / N^j - (p_j^j - \overline{p}_j^j)\right), j=1,..., M, \quad (4)$$

and if all firms charge the same price, $p_j^j = \overline{p}_j^j$, every firm satisfies the same proportion of the aggregate demand: $q_j^j = S_j\left(\left(1-\lambda_j\right)v_{jj}^j + \sum_{i \neq j} \lambda_i v_{ij}^j\right) / N^j = S_j v_j^j / N^j$, where $v_j^j$ represents the willingness to pay of the average consumer in country *j* as a result of the existing demographics in terms of the shares of natives and immigrants. Firms' individual demand increases with the size of the economy: $\partial q_j^j / \partial S_j > 0$; decreases with the proportion of immigrants $\partial q_j^j / \partial \lambda_j < 0$, since their willingness to pay for products from *j* is lower than that of natives: $v_{ij}^j < v_{jj}^j$, and therefore $\partial v_j^j / \partial \lambda_j < 0$; and also decreases and the number of firms as a result of competition $\partial q_j^j / \partial N^j < 0$. We can determine the aggregate sales of all firms in country *j* multiplying firms' individual demand by the number of firms thereby obtaining $Q_j^j = Q_{jj}^j + Q_{ij}^j = S_j v_{jj}^j = S_j v_{jj}^j + S_j v_{ij}^j$, which decomposes aggregate demand into those corresponding to natives and immigrants.

[32] In the US this is basically an illegal activity under the Clayton Act, unless there is a cost justification for the price discrimination (e.g., transportation costs and therefore consumers are discriminated based on their location), but this cannot be considered discrimination as understood in this chapter, which is the discrimination based on preferences.

### 5.2.2. Firm behavior

We assume a market structure corresponding to monopolistic competition with the firm producing according to the following cost function:

$$C(q) = wL_j = w(F + cq_j^j), j = 1,..., M. \quad (5)$$

where *c* is the marginal cost and the production function is $L_j = F + cq_j^j$. Then, the average cost is:

$$AC(q) = \frac{wF}{q_j^j} + wc, j = 1,..., M, \quad (6)$$

while the marginal cost is:

$$MC(q) = wc. \quad (7)$$

Consequently, individual profits are:

$$\pi_j^j = q_j^j\left(p_j^j - wc\right) - wF, \ j = 1,..., M. \quad (8)$$

### 5.2.3. Short and long-run market equilibria.

Each firm will produce the quantity that maximizes profits according to the F.O.C.:

$$\frac{\delta\pi_j^j}{\delta q_j^j} = p_j^j + q_j^j\frac{\partial p_j^j}{\partial q_j^j} - wc = p_j^j - \frac{q_j^j}{S_j} - wc = 0, j = 1,..., M, \quad (9)$$

where marginal revenue in the second equality can be derived from eq. (4) once rewritten as $q_j^j = S_j\left(\left(\left(1-\lambda_j\right)v_{jj}^j + \sum_{i\neq j}\lambda_i v_{ij}^j\right)/N^j - (p_j^j - \overline{p}_j^j)\right) = S_j\left(\left(1-\lambda_j\right)v_{jj}^j + \sum_{i\neq j}\lambda_i v_{jj}^i\right)/N^j + S_j p_j^j - S_j\overline{p}_j^j$ and therefore $\partial q_j^j/\partial p_j^j = S_j$, whose inverse is $\partial p_j^j/\partial q_j^j = -1/S_j$. From (9) we obtain the following equilibrium price–a mark-up over marginal cost:

$$p_j^j = \frac{q_j^j}{S_j} + wc, j = 1,..., M. \quad (10)$$

In the event that all firms charge the same price as we have assumed, then $q_j^j = S_j v_j^j / N^j$. Substituting the previous expression in the equilibrium price (10) we obtain[33]:

$$p_j^j = v_j^j / N^j + wc = \left( \left(1-\lambda_j\right) v_{jj}^j + \sum_{i \neq j} \lambda_i v_{ij}^j \right) / N^j + wc \ , \ j = 1,..., M. \tag{11}$$

and the equilibrium price decreases with the share of the immigrants: $\partial p_j^j / \partial \lambda_j < 0$, since, once again, their willingness to pay for products from *j* is lower than that of natives: $v_{ij} < v_{jj}$, and therefore $\partial v_j^j / \partial \lambda_j < 0$; it is decreasing in the number of firms $\partial p_j^j / \partial N^j < 0$, while it is increasing in marginal cost, $\partial p_j^j / \partial wc > 0$.

With free mobility, when firms make extra profits new entrants will reduce them until they are null, and the incentive to enter the market disappears. Then, in the long run, profits (8)must be null. Under this condition, and substituting the short run equilibrium quantities and prices, the long run number of firms corresponds to:

$$\tilde{N}^j = \frac{\sqrt{S_j} v_j^j}{\sqrt{wF}} = \frac{\sqrt{S_j}\left( \left(1-\lambda_j\right) v_{jj}^j + \sum_{i \neq j} \lambda_i v_{ij}^j \right)}{\sqrt{wF}}, j = 1,..., M. \tag{12}$$

where "~" denotes equilibrium values in the closed economy. Once the number of active firms has been established, we can obtain by substitution the equilibrium output per firm:

$$\tilde{q}_j^j = \sqrt{S_j wF} \ , \ j = 1,..., M, \tag{13}$$

as well as the equilibrium price:

$$\tilde{p}_j^j = \sqrt{\frac{wF}{S_j}} + wc \ , j = 1,..., M. \tag{14}$$

Finally, we can determine the social welfare of the economy—corresponding to the consumer surplus since firms do not make profits, in terms of the aggregate equilibrium amount demanded by each type of consumers, natives and immigrants, and the difference between their respective willingness to pay and the equilibrium price. As the demand functions are linear, the consumer surplus in each of the *M* countries corresponds to:

$$\widetilde{CS}_j = \left( \tilde{Q}_{jj}^j (v_{jj}^j - \tilde{p}_j^j) + \sum_{i \neq j} \tilde{Q}_{ij}^j (v_{ij}^j - \tilde{p}_j^j) \right) / 2 = \frac{\tilde{N}}{2} \left( \left(1-\lambda_j\right) \tilde{q}_{jj}^j (v_{jj}^j - \tilde{p}_j^j) + \sum_{i \neq j} \lambda_i \tilde{q}_{ij}^j (v_{ij}^j - \tilde{p}_j^j) \right) , j = 1,..., M, \tag{15}$$

[33] Therefore, as $N^j$ increases the equilibrium price approaches marginal cost, and the competitive outcome is obtained at the limit: $p_j^j = wc$.

and the worlds' aggregate consumer surplus is $\widetilde{CS} = \sum_j \widetilde{CS}_j$ , $j$ = 1,..., M.

With respect to the final equilibrium values, and consistent with international trade models based on scale economies and monopolistic competition market structures, the number of active firms in the long run is the key variable upon which the solution to the model rests. Particularly, relevant for the analysis is the change in the equilibrium that takes place when international trade takes place and the size of the global economy counts for the firms in each country as consumer from other countries demand products from *j* —i.e., opening country *j* to trade is equivalent to add the additional demand coming from another country $S_i$, $i$ = 1,..., $M$-1. As we analyze in the following section, opening symmetric countries to trade increases the number of firms in the global economy, but reduces it in each country as a result of competition, increases the individual demand satisfied by the surviving firms in each country, and by way of the scale economies reducing average costs, reduces the equilibrium price. These are the contemporary selection and scale effects of trade identified by Krugman (1979, 1980, 1981) by which surviving firms expand their output taking advantage of scale economies, while some firms are forced to exit the market in each country. Contemporarily, the number of varieties for the population in each country increases, which along with the reduction of prices and the increases in the quantities, increases social welfare.

## 5.3. Open economies with uniform prices within countries and price discrimination across countries

To formalize the anticipated results of the effects of opening the economy to international trade, we depart in this section from the autarchy case and allow for trade between countries. We consider two situations with open economies: the case where price discrimination between countries is allowed (but not within countries), and the case where there is a ban on price discrimination as a result of antidumping or antidiscrimination legislation, and therefore firms are forced to charge a uniform price. This section deals with the case of price discrimination while section 5.4 presents the results under uniform pricing.

If a firm in *j* serves goods or services to different markets with alternative demands it can choose (if possible) to set different prices following a third degree-price discrimination strategy that maximizes profits in each market depending on their relative elasticities

(Varian, 1989). Whether price discrimination is feasible or not depends on the inability of buyers to practice arbitrage, so we need to assume that this situation, known as parallel exports/imports, is not feasible. This implies that practicing it is not profitable because it entails a higher cost than any price differential, or it is simply illegal as only authorized wholesale dealers and retailers can carry and sell the products. As a result a consumer situated in one country (e.g., Spain) does not sell the product to a consumer of the same nationality in other country (e.g., Morocco) cheaper than the firms themselves.

### 5.3.1. Individual and aggregate demand

Assuming that a firm can separate consumers into relatively few identifiable markets (e.g., by geographical location) and set different prices according to their heterogeneous willingness to pay, it will follow a price strategy based on the different price elasticities of demand in these markets so as to pursue profit maximization. As a result, a firm in country *j* will discriminate prices between countries and maximize profits in each market. The strategy in *j* will be the one described in the previous section for its home-country (uniform pricing for natives and immigrants), and a similar strategy will be followed in each other country *i* (as it is shown in what follows), according to the characteristics of the population in that country. Besides serving its own native market, we assume that in country *i* where a firm is exporting, there are different types of consumers with different willingness to pay for the same product produced in *j*. In this case, the individuals that were born in *j* and that live in *i* will receive a higher utility from importing products from their homeland than the rest of the individuals residing in that country (born in *i* or in any other country different from *j*). Consequently, in country *i* there are consumers with a higher willingness to pay (people that were born in country *j* and live in country *i* in a proportion that we now denote by $\eta_j$, $0 \leq \eta_j \leq 1$, and those with a lower willingness to pay corresponding to the group of people born in *i* or in any other country different from *j* who live in *i* . The proportion of people living in *i* from countries different from *j* (including natives from *i*) is denoted by $\eta_i$ , $i \neq j$ and, therefore, $\eta_j = (1 - \sum_{i \neq j} \eta_i)$ . As for the first type of consumers, immigrants in *i* that were born in *j* (emigrants from *j* living in *i*), their demand $q_{ji}^j$ corresponds to:

$$q_{ji}^j = v_{ji}^j - p_{ji}^j \ , j = 1,..., M. \tag{16}$$

For the second type of consumers, the demand for products produced in *j* by individuals living in *i* who were not born in the exporting country *j* is:

$$q_{ii}^{j} = v_{ii}^{j} - p_{ii}^{j},\ i \neq j, \tag{17}$$

with $v_{ij}^{j} > v_{ii}^{j}$.

Then, given the size of the economy $S_i$, the aggregate demand in country *i*—subscript—of a product produced in country *j*—superscript—is the counterpart to eq. (3):

$$q_{i}^{j} = S_i\left(\sum_{i\neq j}\eta_i\left(v_{ii}^{j}/N-(p_{ii}^{j}-\overline{p}_{ii}^{j})\right)\right)+S_i\eta_j\left((v_{ji}^{j}/N-(p_{ji}^{j}-\overline{p}_{ji}^{j})\right),\ i\neq j. \tag{18}$$

A relevant qualification is that in the open economy firms compete globally and therefore there is firm competition both within countries and between countries. This implies that the relevant number of active firms is determined globally, with $N=\sum_{j=1}^{M}N^{j}$, replacing the number of firms in a the closed economy. In the event that the willingness to pay of consumers born in any country different from *j* and residing in *i* were the same: $v_{ii}=v_{ki},\forall i,k\neq j$, we could simplify the above expression in the following way: $q_{i}^{j} = S_i\left(1-\eta_j\right)\left(v_{ii}^{j}/N-(p_{ii}^{j}-\overline{p}_{ii}^{j})\right)+S_i\eta_j\left((v_{ji}^{j}/N-(p_{ji}^{j}-\overline{p}_{ji}^{j})\right)$. As before, if country *j* firms cannot discriminate consumers in country *i* based on their country of origin, then $p_{ii}^{j}=p_{ji}^{j}=p_{i}^{j}$ and $\overline{p}_{ii}^{j}=\overline{p}_{ji}^{j}=\overline{p}_{i}^{j}$, and the demand function (18) simplifies to:

$$q_{i}^{j} = S_i\left(\left(\sum_{i\neq j}\eta_i v_{ii}^{j}+\eta_j v_{ji}^{j}\right)/N-(p_{i}^{j}-\overline{p}_{i}^{j})\right),\ i\neq j. \tag{19}$$

Likewise, from country *i*'s perspective we have the corresponding domestic and foreign demands counterparts to eqs. (4) and (19):

$$q_{i}^{i} = S_i\left(\left((1-\lambda_i)v_{ii}^{i}+\sum_{j\neq i}\lambda_j v_{ji}^{i}\right)/N-(p_{i}^{i}-\overline{p}_{i}^{i})\right),\ i\neq j. \tag{20}$$

and

$$q_{j}^{i} = S_j\left(\left(\sum_{j\neq i}\eta_j v_{jj}^{i}+\eta_i v_{ij}^{i}\right)/N-(p_{j}^{i}-\overline{p}_{j}^{i})\right),\ j = 1,\ldots, M. \tag{21}$$

As for the demand parameters in the set of domestic: $q_j^j$, $q_i^i$, and foreign demands: $q_i^j$, $q_j^i$, we recall in the first place the assumption made in the previous section that individuals have a greater preference for the products from their home-land than migrants: $v_{jj}^{j} > v_{ij}^{i}$.

Secondly, this preference for home-land products increases when the individual emigrates (*home-sickness effect*); meaning that an emigrant will have a higher willingness to pay than a national (non-migrant) residing in the country of origin where the good is produced: $v_{ji}^{j} > v_{ji}^{j}$—and therefore greater than that of the nationals in the host country for the products of their country of origin *j*: $v_{ji}^{j} > v_{ii}^{j}$. Finally, we assume that the product will be valued by immigrants to the country where the good is produced to a larger extent than other individuals with the same nationality residing in their country of origin (*blending effect*). The rationale behind this assumption is that if someone migrates, she keeps her preferences from her home-land products, but at the same time develops a taste for goods of the hosting country as they adopt the local life style, and therefore their taste and preferences for the host country products is greater with respect to other co-nationals that are left behind in the home country, and have not migrated: $v_{ij}^{j} > v_{ii}^{j}$. Then, for goods produced in country *j* we have the following ordering of preferences: $v_{ji}^{j} > v_{jj}^{j} > v_{ij}^{j} > v_{ii}^{j}$, and we have a symmetric ordering for products produced in country *i*: $v_{ij}^{i} > v_{ii}^{i} > v_{ji}^{i} > v_{jj}^{i}$. These values can be normalized by the willingness to pay for home products of the individuals, so $v_{jj}^{j} = v_{ii}^{i} = 1$, with the rest of the parameters adopting the following values: $v_{ji}^{j} / v_{jj}^{j} > 1 > v_{ij}^{j} / v_{jj}^{j} > v_{ii}^{j} / v_{jj}^{j}$, and symmetrically for products from country *i*. Consequently we can now relate the preference parameter for products produced in both countries from the perspective of a consumer residing in one of them. Taking again country *j* as the reference: $v_{jj}^{j} > v_{jj}^{i}$, i.e., nationals prefer the varieties produced in their home country over imported ones, while $v_{ij}^{j} > v_{ij}^{i}$ and immigrants from *i* residing in *j* prefer imported varieties over domestic ones. Equally $v_{ii}^{i} > v_{ii}^{j}$ and $v_{ji}^{j} > v_{ji}^{i}$.

As trade opens firms in each country *j*, will seek to discriminate prices *between* countries based on their different demands; as it is the profit maximizing strategy. Note also that demand is also segmented *within* countries as firms in country *j* compete with firms in country *i* for the domestic demand associated to nationals $q_{jj}^{j}$ (eq. (2)), and immigrants $q_{ij}^{j}$ (eq. (1)). In the closed economy studied in the previous section the share of demand in country *j* from immigrants from country *i* could only be met by firms in country *j*, but now it can be met by firms in other countries *i* (including their homeland country). As a result we have both within country and between countries competition.

Then, the total demand of the products in *j* in the *M* countries is:

$$q^j = q_j^j + \sum_{i \neq j} q_i^j = S_j \left( \left( \left(1-\lambda_j\right) v_{jj}^j + \sum_{i \neq j} \lambda_i v_{ij}^j \right) / N - (p_j^j - \overline{p}_j^j) \right)$$
$$+ \sum_{i \neq j} S_i \left( \left( \sum_{i \neq j} \eta_i v_{ii}^j + \eta_j v_{ji}^j \right) / N - (p_i^j - \overline{p}_i^j) \right), j = 1, \ldots, M, \quad (22)$$

and that for firms in *i* is:

$$q^i = q_i^i + \sum_{j \neq i} q_j^i = S_i \left( \left( \left(1-\lambda_i\right) v_{ii}^i + \sum_{j \neq i} \lambda_j v_{ji}^i \right) / N - (p_i^i - \overline{p}_i^i) \right)$$
$$+ \sum_{j \neq i} S_j \left( \left( \sum_{j \neq i} \eta_j v_{jj}^i + \eta_i v_{ij}^i \right) / N - (p_j^i - \overline{p}_j^i) \right), i \neq j. \quad (23)$$

Conversely, we could also define the demands of the individuals residing in each country: $q_j = q_j^j + \sum_{i \neq j} q_j^i$ and $q_i = q_i^i + \sum_{j \neq i} q_i^j$ —noting that the aggregates $\sum_j q^j = \sum_j q_j$ are equal since world production is equal to world demand. Therefore the model yielding the aggregate world equilibrium quantities could be recovered from the aggregation by countries of firms' supplies or consumers' demands. We adopt the perspective of producers since the analysis of the equilibrium values departs from the firms' conditions for profit maximization.

If all firms charge the same price in each country: $p_j^j = \overline{p}_j^j$, $p_i^j = \overline{p}_i^j$, $p_i^i = \overline{p}_i^i$, then equations (22) and (23) simplify as follows:

$$q^j = q_j^j + \sum_{i \neq j} q_i^j = S_j v_j^j / N + \sum_{i \neq j} S_i v_i^j / N \ , \ j = 1, \ldots, M. \quad (24)$$

and that for firms in *i*:

$$q^i = q_i^i + \sum_{j \neq i} q_j^i = S_j v_i^i / N + \sum_{j \neq i} S_j v_j^i / N \ , \ i \neq j. \quad (25)$$

where $v_j^j = \left(1-\lambda_j\right) v_{jj}^j + \sum_{i \neq j} \lambda_i v_{ij}^j$, $v_i^j = \sum_{i \neq j} \eta_i v_{ii}^j + \eta_j v_{ji}^j$, $v_i^i = \left(1-\lambda_i\right) v_{ii}^i + \sum_{j \neq i} \lambda_j v_{ji}^i$ and $v_j^i = \sum_{j \neq i} \eta_j v_{jj}^i + \eta_i v_{jj}^i$ are the corresponding representative consumers. The response of firms' domestic demands with respect to the homeland variables remain as presented in the closed economy, i.e., taking country *j* as reference: $\partial q_j^j / \partial S_j > 0$, $\partial q_j^j / \partial \lambda_j < 0$, and $\partial q_j^j / \partial N < 0$, while for their foreign demands—exports—they are increasing in the size of other countries' economies: $\partial q_i^j / \partial S_i > 0$; increasing in the proportion of emigrants $\partial q_i^j / \partial \eta_j > 0$, since their willingness to pay for products from *j* is higher than that of

natives: $v_{ji}^{j} > v_{ii}^{j}$, and therefore $\partial v_i^j / \partial \eta_j > 0$; and decreasing in the number of firms as a result of competition $\partial q_i^j / \partial N < 0$.

### 5.3.2. Firm behavior

We consider that firms in each country are symmetrical and produce according to the cost function exhibiting scale economies presented in (5), with the same average and marginal costs: (6) and (7), respectively. Therefore individual profits in the open economy correspond to:

$$\pi^j = q_j^j\left(p_j^j - wc\right) + \sum_{i \neq j} q_i^j\left(p_i^j - wc\right) - wF \text{ , } j=1 \text{ ,..., } M. \tag{26}$$

### 5.3.3. Short and long run market equilibria.

Taking as reference firms in country *j*—since the equilibrium values for other countries are obtained equally—and the assumptions on cost and market structures —scale economies and monopolistic competition, each firm in country *j* will produce the quantity that maximizes profits according to the following set of first order conditions:

$$\begin{aligned} \frac{\delta \pi^j}{\delta q_j^j} &= p_j^j + q_j^j \frac{\partial p_j^j}{\partial q_j^j} - wc = p_j^j - \frac{q_j^j}{S_j} - wc = 0, \quad j = 1,...,M, \\ \frac{\delta \pi^j}{\delta q_i^j} &= p_i^j + q_i^j \frac{\partial p_i^j}{\partial q_i^j} - wc = p_i^j - \frac{q_i^j}{S_i} - wc = 0, \quad i \neq j, \end{aligned} \tag{27}$$

where, as for the case of the close economy, marginal revenues in the second equalities can be derived from eq. (22) with $\partial p_j^j / \partial q_j^j = -1/S_j$ , $\partial p_i^j / \partial q_i^j = -1/S_i$. From the set of first order conditions we obtain the set of discriminatory prices in the short run:

$$\begin{aligned} p_j^j &= \frac{v_j^j}{N} + wc, \; j = 1,\ldots,M. \\ p_i^j &= \frac{v_i^j}{N} + wc, \; i \neq j \end{aligned} \tag{28}$$

and the price charged by firms in the domestic market behaves as in the close economy case: $\partial p_j^j / \partial \lambda_j < 0$, $\partial p_j^j / \partial N < 0$ and $\partial p_j^j / \partial wc > 0$, while those charged in foreign markets

are increasing in the share of emigrants: $\partial p_i^j / \partial \eta_j > 0$, since their willingness to pay for products from $j$ is higher than that of natives: $v_{ij}^j > v_{ii}^j$ , resulting in $\partial v_i^j / \partial \eta_j > 0$; decreasing in the global number of firms $\partial p_i^j / \partial N < 0$, and also increasing in the constant marginal cost $\partial p_i^j / \partial wc > 0$.

From the previous result it is clear that the price discrimination strategy results in firms charging higher prices, the higher the willingness to pay of the representative consumers. In fact, we can establish the price differential between any two pair prices by subtracting them; e.g., the difference between the price charged in the domestic market $p_j^j$ and any foreign market $p_i^j$, $i$ = 1,..., $M$-1 is:

$$p_j^j - p_i^j = \frac{v_j^j - v_i^j}{N} = \frac{\left(\left(\left(1-\lambda_j\right)v_{jj}^j + \sum_{i\neq j}\lambda_i v_{ij}^j\right) - \left(\sum_{i\neq j}\eta_i v_{ii}^j + \eta_j v_{ji}^j\right)\right)}{N}, \tag{29}$$

and therefore prices will differ across countries unless the representative individuals are the same. Clearly this result related to prices translated to quantities, and it could be equally shown that when the representative consumers are the same the quantities produced for the domestic and foreign markets—and therefore overall production—are the same across countries, *i.e.*, $q_j^j = q_i^i$, $q_i^j = q_j^i$, and $q^j = q^i$ .

As for the long run, in the open economies case any positive (negative) profit will draw (eject) firms to (from) the market, until the zero profit condition is satisfied. Therefore, the sum of the profits of the representative firm producing in each country in the global economy must be null:

$$\sum_j \pi^j = \sum_j \left( q_j^j \left(p_j^j - wc\right) + \sum_{i\neq j} q_i^j \left(p_i^j - wc\right) - wF \right) = 0 . \tag{30}$$

Substituting the short run quantities and prices in this expression it is possible to recover the number of active firms in the long run:

$$\widehat{N} = \sqrt{\frac{\sum_j \left(S_j v_j^{j2} + \sum_{i\neq j} S_i v_i^{j2}\right)}{MwF}} , \tag{31}$$

where "$\widehat{\cdot}$" denotes equilibrium values in the open economy with price discrimination. Therefore, the equilibrium quantities corresponding to domestic and foreign demands are obtained by substituting the number of firms into (24):

$$\hat{q}^j = \hat{q}_j^j + \sum_{i \neq j} \hat{q}_i^j = \frac{S_j v_j^j \sqrt{MwF}}{\sqrt{\sum_j \left( S_j v_j^{j2} + \sum_{i \neq j} S_i v_i^{j2} \right)}} + \sum_{i \neq j} \frac{S_i v_i^j \sqrt{MwF}}{\sqrt{\sum_j \left( S_j v_j^{j2} + \sum_{i \neq j} S_i v_i^{j2} \right)}}, j=1, \ldots, M. \quad (32)$$

As a result domestic demand reduces (increases) as the share of immigrants increases (decreases), while foreign demands—exports—increase (decrease) with the share of emigrants.

The equilibrium prices can be also obtained substituting the number of firms in (28):

$$\begin{aligned} \hat{p}_j^j &= \frac{v_j^j \sqrt{MwF}}{\sqrt{\sum_j \left( S_j v_j^{j2} + \sum_{i \neq j} S_i v_i^{j2} \right)}} + wc, j = 1, \ldots, M, \\ \hat{p}_i^j &= \frac{v_i^j \sqrt{MwF}}{\sqrt{\sum_j \left( S_j v_j^{j2} + \sum_{i \neq j} S_i v_i^{j2} \right)}} + wc, \quad i \neq j. \end{aligned} \quad (33)$$

As the optimal quantities, domestic prices are decreasing in the share of immigrants, while exporting prices are increasing in the share of emigrants.

Regarding the number of firms in the open economy $\hat{N}$, we note that since all firms are symmetric, the distribution of firms by country can only be ascertained in terms of the equilibrium in the closed economy. That is, once economies open to trade we could use as allocating rule the relative proportion of the number of firms in each closed economy on the overall number of firms. In the case of symmetric economies: $\tilde{N}^j = \tilde{N}^i, \forall i, j$, while for countries differing in size and representative consumers, the number of firms in each closed economy will be different across countries. Therefore, before opening countries to trade, and assuming that cost functions are equal, the number of firms in each country will depend on its size and demographic structure, and we can define the proportion that the firms in a country represent on the total number of firms in the global economy as $\tilde{\omega}^j = \tilde{N}^j / \sum_j \tilde{N}^j$. Once the economies open to trade, the global number of firms $\hat{N}$ can be allocated across countries according to these proportions: $\hat{N}^j = \hat{N}\tilde{\omega}^j$. This allocation rule based on the close economy results, is used in turn to determine the overall quantity produced in each country and can be used to define the aggregate welfare effects of opening economies to trade under either price discrimination or uniform pricing.

Therefore, the social welfare associated to the equilibrium quantities supplied by firms in *j* defines as the sum of the aggregate amounts demanded by each type of consumers: i) natives (in countries *j* and *i*, $i \neq j$, ii) immigrants from *i*, $i \neq 1,\ldots,M$-1, into *j*, and iii) emigrants from *j* into *i*, $i \neq 1,\ldots,M$-1, multiplied by the difference between their respective willingness

to pay and the equilibrium prices. For the open economies, the consumer surplus associated to the goods produced in each one of the *M* counties defines as follows:

$$\widehat{CS}_j = \left( \widehat{Q}_{jj}^j (v_{jj}^j - \widehat{p}_j^j) + \sum_{i \neq j} \widehat{Q}_{ij}^j (v_{ij}^j - \widehat{p}_j^j) + \sum_{i \neq j} \widehat{Q}_{ii}^j (v_{ij}^j - \widehat{p}_i^j) + \widehat{Q}_{ji}^j (v_{ji}^j - \widehat{p}_i^j) \right) / 2 =$$

$$= \frac{\widehat{N}^j}{2} \left[ \left( \left(1 - \lambda_j\right) \widehat{q}_{jj}^j (v_{jj}^j - \widehat{p}_j^j) + \sum_{i \neq j} \lambda_i \widehat{q}_{ij}^j (v_{ij}^j - \widehat{p}_j^j) \right) + \left( \sum_{i \neq j} \eta_i \widehat{q}_{ii}^j (v_{ii}^j - \widehat{p}_i^j) + \eta_j \widehat{q}_{ji}^j (v_{ji}^j - \widehat{p}_i^j) \right) \right], j = 1, \ldots, M, \quad (34)$$

while the worlds' aggregate consumer surplus is $\widehat{CS} = \sum_j \widehat{CS}_j$ .

### 5.3.4. Comparing the closed and open economies.

Comparing the results corresponding to the long run equilibrium of the open economies with price discrimination between countries to those of the closed economy, we obtain a set of relationships that are organized as propositions. In the first one, we compare the results obtained in this section with those of the closed economy, assuming that the size of the economies is the same across countries as well as their demographic structures in terms of the willingness to pay parameters migration shares, resulting in the same representative consumers. This allows us to obtain results of a simpler model constituting a particular case of the one already developed, and corresponding to a standard new trade theory model except for the heterogenous demand parameters. Subsequently we shall allow for increases in the shares of immigrants/emigrants so as to investigate how these changes in demographic structures influence domestic production as well as trade patterns.

**Proposition 1 (with respect to the closed economy, opening economies to trade increases the number of firms (varieties), increases the amount produced by the single firm, results in lower prices in every country, while whether social welfare is larger, equal, or smaller depends on the population demographics).** *Given the assumptions on equal sizes of the economies, market demands (willingness to pay and demographic structure) resulting in the same representative consumers, production costs (economies of scale) and market structure (monopolistic competition with uniform prices within countries and price discrimination between countries), opening countries to trade:*

*(ia) increases the global number of firms (varieties) accessible to consumers in each country* $\tilde{N}^j < \hat{N}$, *(ib) while reducing their number in each country,* $\tilde{N}^j > \hat{N}/M$ ; (*iia*) *increases the total amount produced by the individual firm in each country* $\tilde{q}^j = \tilde{q}_j^j < \hat{q}^j$, *but* (*iib*) *reduces the production for the domestic market* $\tilde{q}^j = \tilde{q}_j^j > \hat{q}_j^j$, *while* (*iic*) *supplying the foreign market,* $\tilde{q}^j = \tilde{q}_j^j > \hat{q}_i^j > 0$ ; *(iiia-b) reduces both domestic and foreign (export) prices:* $\tilde{p}_j^j > \hat{p}_j^j$ *and* $\tilde{p}_i^j > \hat{p}_i^j$, *respectively; and, finally, whether social welfare is smaller, equal, or larger:* $\widetilde{CS} > \widehat{CS} \vee \widetilde{CS} = \widehat{CS} \vee \widetilde{CS} < \widehat{CS}$, *depends on the demographic structure of the economy* .

We only need to prove the first the proposition, since the remaining inequalities in quantities and prices are obtained by substituting the long run number of firms in the closed and open economies.

**Proof of parts (*ia*) and (*ib*)** : To prove that $\tilde{N}^j < \hat{N}$ and $\tilde{N}^j > \hat{N}/M$ we only need to compare the number of firms in the long run equilibria corresponding to the closed and open economies, assuming that countries are of the same size, $S_j = S_i, \forall i, j$, and that the representative consumers are also equal across countries as a result of symmetric demographic structures; $v_j^j = v_i^i = v_i^j = v_j^i, \forall i, j$ . For the close economy—eq. (12), $\tilde{N}^j = \sqrt{S_j v_j^{j2}/wF}$, while the number of firms in the world economy—eq. (31)—is $\hat{N} = \sqrt{S_j v_j^{j2}/MwF} = \sqrt{MS_j v_j^{j2}/wF}$ and therefore (*ia*) is verified. As for (*ib*): $\tilde{N}^j = \sqrt{S_j v_j^{j2}/wF} > \hat{N}/M = \sqrt{S_j v_j^{j2}/MwF}$ .

**Proof of parts (*iia*), (*iib*) and (*iic*)**: $\tilde{q}^j = \tilde{q}_j^j < \hat{q}^j$ , $\tilde{q}^j = \tilde{q}_j^j > \hat{q}_j^j$ and $\tilde{q}^j = \tilde{q}_j^j > \hat{q}_i^j > 0$ , follow directly by substituting the respective long run number of firms into the equilibrium quantities of the closed and open economies.

**Proof of parts (*iiia*) and (*iiib*)**: $\tilde{p}_j^j > \hat{p}_j^j$ *and* $\tilde{p}_i^j > \hat{p}_i^j$ , follow directly by substituting the respective long run number of firms into the equilibrium process of the closed and open economies.

**Proof of part (*iv*)**: First we prove that social welfare in the open economy can be smaller. Since countries are symmetric we can state the proof comparing the consumer surplus in the representative country *j*, and it can be extended straightforwardly to the world economy since the difference holds for the remaining *M*-1 countries. Let us take the extreme case where migration does not exit; i.e., countries trade but their populations are natives. In this case eqs. (15) and (34) become $\widetilde{CS}_j = \frac{\tilde{N}^j}{2}\tilde{q}_{jj}^j(v_{jj}^j - \tilde{p}_j^j)$ and $\widehat{CS}_j = \frac{\hat{N}/M}{2}\left[\hat{q}_{jj}^j(v_{jj}^j - \hat{p}_j^j) + \hat{q}_{ii}^j(v_{ii}^j - \hat{p}_i^j)\right]$, respectively. Given the difference in quantities—proposition (*iia*), the ordering of the willingness to pay parameters, and prices (propositions (*iiia-iiib*)), it can be shown that $\hat{q}_{jj}^j(v_{jj}^j - \hat{p}_j^j) + \hat{q}_{ii}^j(v_{ii}^j - \hat{p}_i^j) > \tilde{q}_{jj}^j(v_{jj}^j - \tilde{p}_j^j)$, but the difference in the number of firms ($\hat{N}/M < \tilde{N}^j$) outweighs the previous inequality, yielding $\widehat{CS}_j < \widetilde{CS}_j$. Secondly we prove that social welfare in the open economy can be larger. Under the same assumption of symmetry across countries, but considering now as extreme situation that where all natives in *j* migrate to other countries, so a country's population is made of immigrants only, eqs. (15) and (34) become $\widetilde{CS}_j = \frac{\tilde{N}^j}{2}\tilde{q}_{ij}^j(v_{ij}^j - \tilde{p}_j^j)$ and $\widehat{CS}_j = \frac{\hat{N}/M}{2}\left[\hat{q}_{ij}^j(v_{ij}^j - \hat{p}_j^j) + \hat{q}_{ji}^j(v_{ji}^j - \hat{p}_i^j)\right]$, respectively. Making use of the previous propositions $\hat{q}_{ij}^j(v_{ij}^j - \hat{p}_j^j) + \hat{q}_{ji}^j(v_{ji}^j - \hat{p}_i^j) > \tilde{q}_{ij}^j(v_{ij}^j - \tilde{p}_j^j)$, but this time the difference $\hat{N}/M < \tilde{N}^j$ does not outweigh the previous inequality and $\widehat{CS}_j > \widetilde{CS}_j$. Finally, departing from any of these two extreme situations yielding the largest differences in social welfare, any change in the population demographics increasing the shares of immigrants/emigrants, or reducing them, respectively, reduces the differential between both consumer surpluses, and there exists an intermediate situation where both surpluses have the same value and $\widehat{CS}_j = \widetilde{CS}_j$.

The relevance of proposition 1 (*iv*) is exceptional because contrary to the standard intra-industry trade models based on scale economies and monopolistic competition, where consumers are homogenous, and opening countries to trade *always* results in an increase in social welfare; in the model with heterogeneous consumers that we have developed, if populations willingness to pay for foreign products is lower that for their homeland products, opening countries to trade could be detrimental to social welfare because the number of firms (varieties available) does no increase significantly; certainly not enough to outweigh the fall in individual domestic and exported productions and, as a result, overall production diminishes. From the perspective of consumers welfare this fall in

production cannot be overcome but the fall in prices and the net result is a loss of consumer surplus. *Consequently, opening countries to trade when consumers present different willingness to pay with a bias in favor of homeland products and against foreign products, while increasing trade between countries, results in lower social welfare*.

### 5.3.5. The pro-trade effect and social welfare enhancing effect of migration.

Once we have discussed the properties of the model regarding the comparison between the long run equilibria in the closed and open economies with price discrimination, we now summarize how the obtained results for the open economies vary as the demographic structures of countries changes as a result of increases in the share of emigrants/emigrants. In this case we retain the assumption of symmetry in the size of the economies, so any changes in the long run equilibrium variables can be solely attributed to the change in the share of immigrants/emigrants. As for this change we assume that crossed migrations are the symmetric, i.e., the number of individuals leaving from *j* for country *i*, is the same that the number of individuals leaving from *i* for country *j*. This implies that the population shares for natives and immigrants are the same across countries before and after the increment in the share of immigrants/emigrants has taken place. The obtained results are summarized in the following proposition:

**Proposition 2 (the pro-trade effect and the social welfare enhancing effect of migration).** *Given the assumptions on equal sizes of the economies, market demands (willingness to pay and demographic structure) resulting in the same representative consumers*, *production costs (economies of scale) and market structure (monopolistic competition with uniform prices within countries and price discrimination between countries), increasing the number of immigrant/emigrants between countries in the same proportion: (i) increases the global number of firms (varieties) accessible to consumers in each country*; (*iia*) *reduces the quantity produced by the individual firm for the domestic market; (iib) increases the quantity produced for the foreign market (exports/imports); (iiia-b) reduces domestic prices while increasing foreign (export) prices, respectively ; and (iv) increases social welfare*.

**Proof of part (*i*)**: The symmetry of market demands (demographic structures) implies that $v_j^j = v_i^i, \forall i, j$ and $v_i^j = v_j^i, \forall i, j$, with $\lambda_j = \lambda_i, \forall i, j$. The assumption that migrations flows should compensate so as to yield equal representative consumers across countries implies the following conditions: $dv_j^j = dv_i^i, \forall i, j$ and $dv_i^j = dv_j^i, \forall i, j$. Differentiating the representative consumers with respect to immigrants/emigrants shares shows that previous conditions require that $d\lambda_j = d\lambda_i, \forall i, j$ and $d\eta_j = d\eta_i, \forall i, j$. In this setting we need to show that the effect on the number of firms of increasing the share of immigrants/emigrants across all countries is positive: $\frac{\partial \hat{N}}{\partial \lambda_j \partial \eta_j} > 0$. Departing from eq. (31) this is the same as determining the sign of the derivative of the numerator of the number of firms, that under the previous assumptions of symmetry in size and market demands equals $\sqrt{MS_j\left(v_j^{j2} + v_i^{j2}\right)}$. Therefore the sign will depend on the sign of the derivative $\partial\left(v_j^{j2} + v_i^{j2}\right) / \partial\lambda_j\partial\eta_j = \partial v_j^{j2} / \partial\lambda_j + \partial v_i^{j2} / \partial\eta_j$. In the last equality $\partial v_j^{j2} / \partial\lambda_j < 0$ while $\partial v_i^{j2} / \partial\eta_j > 0$, with the former being smaller than the latter given the ordering of preferences assumed: $v_{ji}^j > v_{jj}^j > v_{ij}^j > v_{ii}^j$, and therefore the net variation is positive.

**Proof of parts (*iia*) and (*iib*):** For (*iia*), given the definition of the quantities (32), we need to show that $\frac{\partial \hat{q}_j^j}{\partial \lambda_j \partial \eta_j} < 0$. As for the numerator $\partial v_j^j / \partial \lambda_j = \left(v_{ij}^j - v_{jj}^j\right) < 0$, so increasing the share of immigrants results in a negative sign in the numerator; while $\partial\left(v_j^{j2} + v_i^{j2}\right) / \partial\lambda_j\partial\eta_j > 0$ in the denominator as already shown, thereby reinforcing the fall in domestic demand. Consequently, increasing the share of immigrants/emigrants results in a reduction in the quantity produced by the individual firm for the domestic market. As for (*iib*), we need to show that $\frac{\partial \hat{q}_i^j}{\partial \lambda_j \partial \eta_j} > 0$. The change in the numerator of $\hat{q}_i^j$ is given by $\partial v_i^j / \partial \eta_j = \left(v_{ji}^j - v_{ii}^j\right) > 0, j = 1, ..., M$, while, once again, the change in the denominator is positive $\partial\left(v_j^{j2} + v_i^{j2}\right) / \partial\lambda_j\partial\eta_j > 0$. However, the growth in the denominator is smaller than in the numerator, and therefore increasing the share of immigrants/emigrants increases the quantity produced by the individual firm for the foreign market (exports/imports).

**Proof of parts (*iiia*) and (*iiib*)**: Given the definition of the domestic and foreign prices (33), the proofs showing $\frac{\partial \widehat{p}_j^j}{\partial \lambda_j \partial \eta_j} < 0$ and $\frac{\partial \widehat{p}_i^j}{\partial \lambda_j \partial \eta_j} > 0$ mirror those presented for quantities.

**Proof of part (*iv*):** We need to show that $\frac{\partial \widehat{CS_j}}{\partial \lambda_j \partial \eta_j} < 0$. As in proposition 1(*iv*), since countries are symmetric we can state the proof for the representative country *j*, which equally applies to the remaining *M*-1 countries, and therefore for the aggregate consumer surplus in the world economy. Departing from eq. (34), the proof relays in the previous propositions regarding the number of firms, quantities and prices. Particularly it is straightforward to show that the net effect of increasing the shares of immigrants and immigrants, increases the consumer surplus in foreign markets (countries): $\partial CS_i^j / \partial \lambda_j \partial \eta_j = \partial \left( \sum_{i \neq j} \eta_i \tilde{q}_{ii}^j (v_{ii}^j - \tilde{p}_i^j) + \eta_j \tilde{q}_{ji}^j (v_{ji}^j - \tilde{p}_i^j) \right) / \partial \lambda_j \partial \eta_j > 0$, to a larger extent that the fall in the consumer surplus of the domestic market, $\partial CS_j^j / \partial \lambda_j \partial \eta_j = \left( \left(1 - \lambda_j\right) \tilde{q}_{jj}^j (v_{jj}^j - \tilde{p}_j^j) + \sum_{i \neq j} \lambda_i \tilde{q}_{ij}^j (v_{ij}^j - \tilde{p}_j^j) \right) < 0$. Therefore, the net effect of both changes is positive:

$$\partial \left( \left(1 - \lambda_j\right) \tilde{q}_{jj}^j (v_{jj}^j - \tilde{p}_j^j) + \sum_{i \neq j} \lambda_i \tilde{q}_{ij}^j (v_{ij}^j - \tilde{p}_j^j) \right) / \partial \lambda_j \partial \eta_j + \partial \left( \sum_{i \neq j} \eta_i \tilde{q}_{ii}^j (v_{ii}^j - \tilde{p}_i^j) + \eta_j \tilde{q}_{ji}^j (v_{ji}^j - \tilde{p}_i^j) \right) / \partial \lambda_j \partial \eta_j$$

> 0 and consumers welfare increases.

The intuition of these propositions is rather clear. Given our reasonable assumptions on the ordering of the willingness to pay parameters, and departing from a base scenario where countries are symmetric, increasing the share for of emigrants/immigrants in the world economy boosts global demand thereby increasing the number of firms and the quantity produced in the global economy. The positive effect however is the net result of the reduction in the quantity produced in each country for the domestic demand (which is decreasing in the number of immigrants), and the increment of production for the foreign demand (which is increasing on the number of emigrants). Prices follow the corresponding patterns, as domestic demand reduces, home price fall, while foreign (export) prices rises with the growth of foreign demand. The overall net effect in terms of consumer surpluses is positive.

### 5.3.6. An illustrating example with two countries.

We now illustrate the results summarized in propositions 1 and 2 with a simple example. A situation in which two countries *i* and *j* have the same size ($S_i = S_j = 100; S = 200$), and the willingness to pay for the products produced in country *j* for an immigrant in country *j* is 25% lower than the willingness to pay of natives from *j* (i.e., $v_{jj}^j = 1; v_{ij}^j = 0.75$). Additionally, if the economies are opened to trade, the natives from *j* living in *i* have a 25% higher willingness to pay for the products from her homeland than those who have not migrated. Finally, individuals living in *i* that were not born in *j*, will valued a 50% less the products coming from *j* ($v_{ji}^j = 1.25; v_{ii}^j = 0.5$). We further assume that: i) willingness to pay are equal for the population in *j* with respect to the products from *j*, than for the population in *i* with respect to the products produced in *i*; and ii) that the cost functions are equal wherever the firm is located, with the following parameters: $w = 1$; $c = 0.2$ and $F = 0.5$.

**Figure 5.1** illustrates the total number of firms producing in each country and the total number of firms when the economy is open, that it is equivalent to the number of varieties that a consumer in any country may consume (when the economy is close, the consumer only can consume domestic varieties). The total number of varieties accessible in each country is always larger in the open economy case—Proposition 1 (*ia*)— than in the close economy (red line versus blue line), although the total number of firms located in each country reduces with respect to the close economy (green line versus blue line) as states Proposition 1 (*ib*). As the share of immigrants in the economy increases, the number of varieties reduces in the close economy, since the representative consumer in the country has a lower willingness to pay, while it increases in the open economy—Proposition 2 (*i*). In the open economy, although the representative consumer in the domestic market also reduces her willingness to pay, it is more than compensated with the increasing in the willingness to pay of the representative consumer in the foreign market due to the *home-sickness effect*.

**Figure 5.1. Number of firms (varieties). Closed and open economies.**

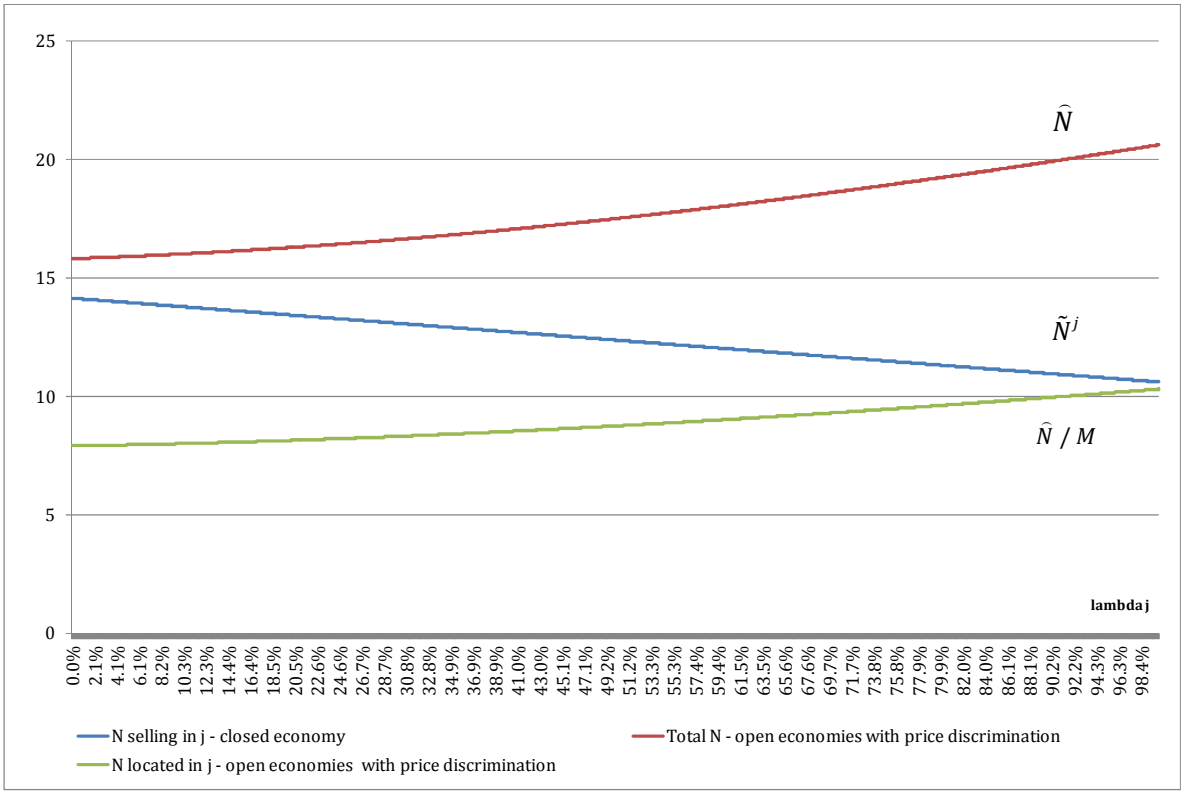
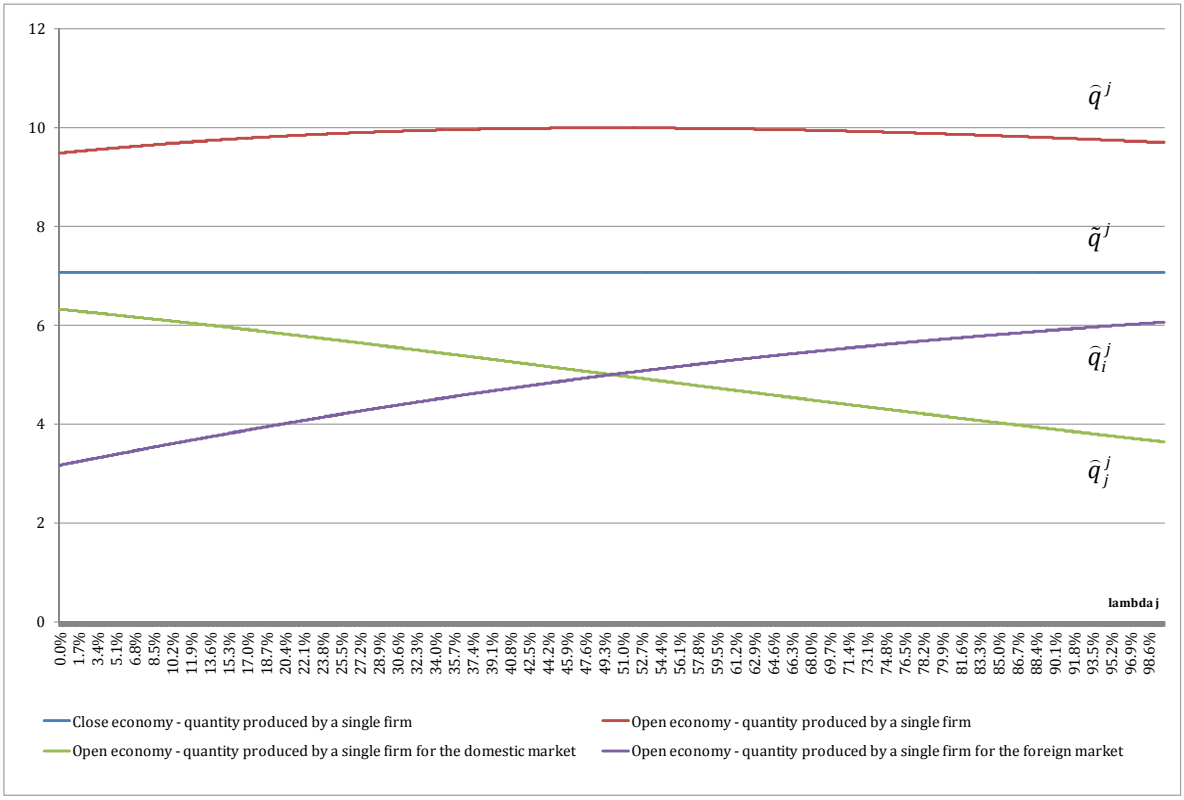



**Figure 5.2** shows the total quantity produced by a single firm in a country *j*, differentiating between the closed economy and the economy opened to trade with firms discriminating prices across countries. For any share of immigrants in *j*, the total quantity sold by a firm in the long run in the open economy is higher than in the closed economy—Proposition 1 (*iia*). This is related with the economies of scale that firms should exploit to maintain themselves operating in the market. For the open economies case, both the domestic and foreign (export) productions are depicted, showing that when the economy opens to trade, the production of the individual firm increases. However, a larger quantity is for the foreign market, reassigning part of the production to the foreign market —Proposition 1 (*iib*). Then, although the overall production of the individual firm increases with respect to the economy in autarky, the quantity sold in the domestic market reduces.

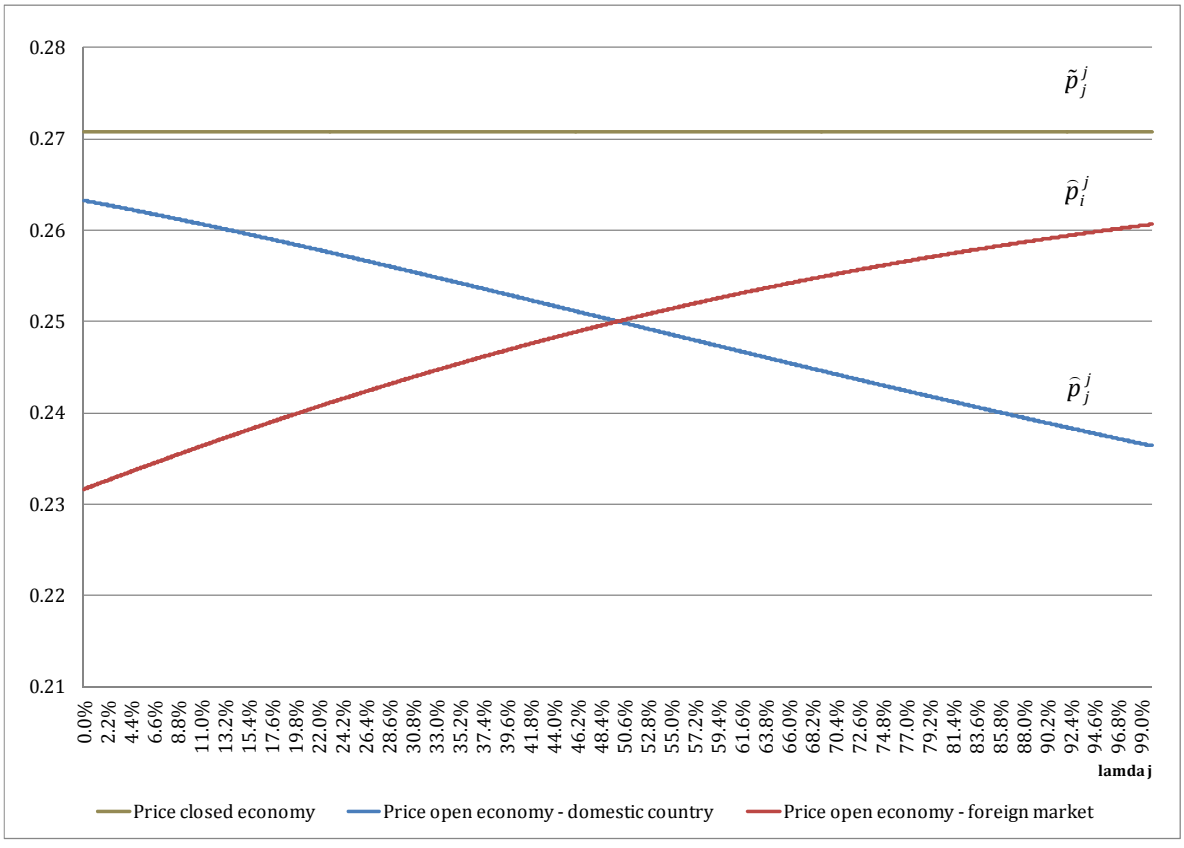
**Figure 5.2. Quantities sold by the individual firms. Closed economy and open economy for the domestic and foreign (exports) markets.**




As shown in **Figure 5.2** for the close economy, as the share of immigrants from *i* in *j* increases, the quantity sold by the single firm does not change (although the representative consumer in *j* has a lower willingness to pay) since there is a reduction in the total number of varieties (number of firms) in the market (**Figure 5.1**). However, when the economy is open, this reduction in the willingness to pay of the representative consumer in the domestic market is partially compensated by the increment of the willingness to pay of the representative consumer in the foreign market (when emigration exists), ending with an increment in the total output of each single firm, until migration shares reach a threshold value ($\lambda_j$ = 0.5 in this example where countries and individuals are symmetric in size and demand parameters, respectively), and the total production of each firm begins to reduce again. Then, as the share of immigrants from *i* in *j* increases over the total population in *j*, the representative consumer in *j* has a lower willingness to pay for the products from *j*. At the same time, if the movements of population are such that the migrations flows are symmetric, i.e., the share of immigrants from *j* in *i* ($\eta_j$) also increases, then the willingness to pay of the representative consumer in *i* for *j* products also increases. These two phenomena, as it is shown in **Figure 5.2** result in a reassignment of the production of the firms in *j*, that find more profitable to export a higher share of their production to *i* than sell it domestically in *j*, Proposition 2 (*iia, iib*).

As shown in **Figure 5.3**, once the economies open to trade, and if firms are symmetric in terms of cost functions, the price reduces in every market as result of the economies of scale and monopolistic competition. When the economies are opened firms start to compete with a larger number of rivals. This forces firms to reduce the price as stated in Proposition 1 (*iiia-b*). In addition, **Figure 5.3** shows that in the closed economy, when migration flows are symmetric (keeping the size of the economy constant), the price is not affected by the changes in the demographic composition, as it is the number of firms the variable absorbing the change in the demand in of the representative consumer (as shown in **Figure 5.1,** as the share of immigrants increases, the number of firms reduces as a result of the lower willingness to pay for *j* products of the increasing number of immigrants).

**Figure 5.3. Price in the closed economy, and domestic and export prices in the open economy.**

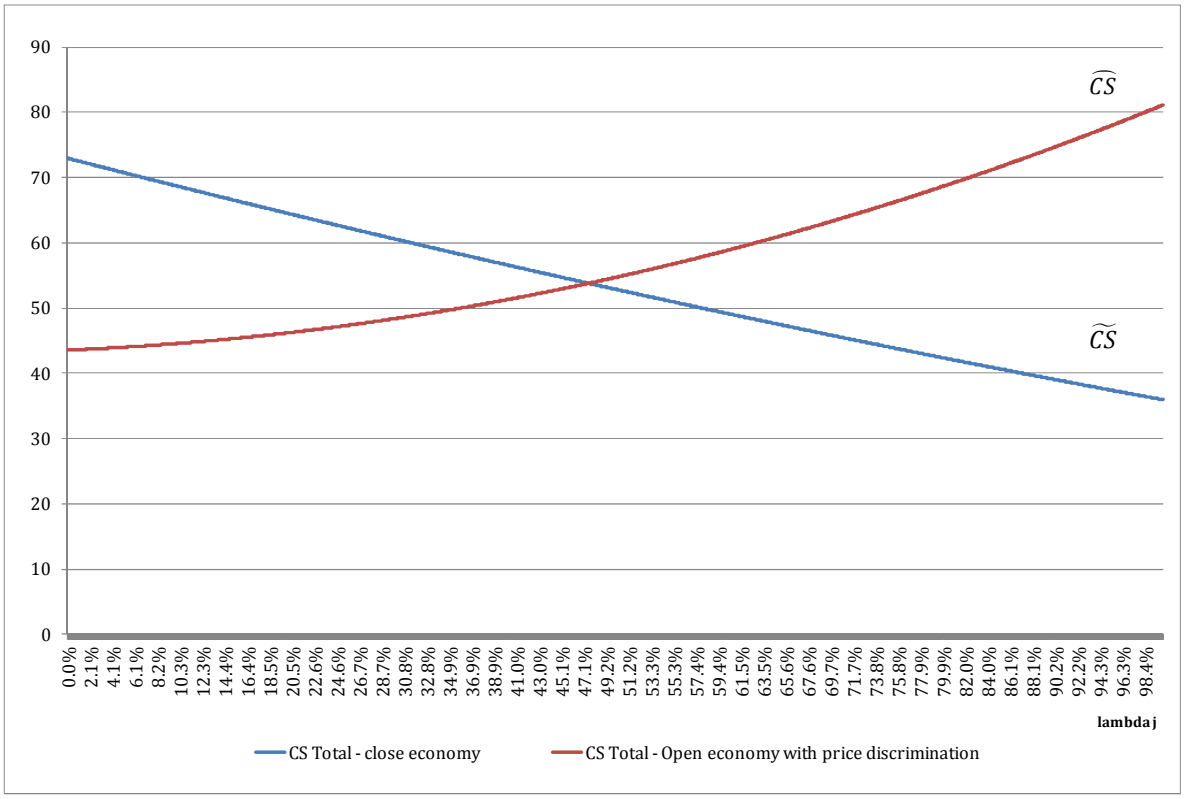



In addition, if the migration flows are symmetric, when economies open to trade, as the share of immigrants from *i* in *j* increases, the price in *j* reduces as the representative

consumer in *j* starts to have a lower willingness to pay for the products from *j*, while the price in *i* increases given as the willingness to pay of the representative consumer in *i* is higher—Proposition 2 (*iiia-b*).

**Figure 5.4** shows consumer surpluses for the representative country in the closed and open economy. It is noteworthy the fact that contrary to the social welfare enhancing effect of that opening countries to trade have in standard intra-industry model, when consumers are heterogeneous, the consumer surplus of the two countries in autarky is higher than the consumer welfare of the open economies if the share of immigrants from one country in the other is not larger enough (50% in the example). It is important to remark that this result is for a given structure of willingness to pay parameters. In a situation in which the parameters of the demands were not symmetric for *i* and *j*, the results would be different.

**Figure 5.4. Consumer surpluses. Close and open economies.**




## 5.4. Open economies with uniform prices both within and between countries.

If price discrimination is not allowed as a result of competition policy or antitrust legislation, the firm is forced to set a uniform price, $p^j$, both within each country and between countries.

### 5.4.1. Individual and aggregate demand.

Demand functions correspond to those already introduced in the previous sections: (18) thru (21), while the ordering of the parameters representing willingness to pay are the same. Departing from total demand for *j* products from the *M* countries and the symmetric definition for any country *i*, eqs. (24) and (25), and assuming that firms cannot discriminate prices within a country and between countries, so they charge every type of consumers the same price: $p_{jj}^j = p_{ij}^j = p_j^j$ and $\overline{p}_{jj}^j = \overline{p}_{ij}^j = \overline{p}_j^j$, market demand from the individual firm in country *j* simplifies to

$$q^j = S_j\left(\left(1-\lambda_j\right)v_{jj}^j + \lambda_j v_{ij}^j\right) + \sum_{i\neq j} S_i\left(\left(1-\eta_j\right)v_{ii}^j + \eta_j v_{ji}^j\right)/N + S\left(p^j - \overline{p}^j\right),\ j = 1,\ldots, M. \tag{35}$$

where, $S = \sum_j S_j$. If every firm charges the same price, then

$$q^j = q_j^j + \sum_{i\neq j} q_i^j = S_j v_j^j / N + \sum_{i\neq j} S_i v_i^j / N,\ j = 1,\ldots, M. \tag{36}$$

and similarly for the products produced in i:

$$q^i = S_i v_i^i / N + \sum_{j\neq i} S_j v_j^i / N,\ i \neq j \tag{37}$$

where, once again, $v_j^j = \left(1-\lambda_j\right)v_{jj}^j + \sum_{i\neq j}\lambda_i v_{ij}^j$, $v_i^j = \sum_{i\neq j}\eta_i v_{ii}^j + \eta_j v_{ji}^j$, $v_i^i = \left(1-\lambda_i\right)v_{ii}^i + \sum_{j\neq i}\lambda_j v_{ji}^i$ and $v_j^i = \sum_{j\neq i}\eta_j v_{jj}^i + \eta_i v_{jj}^i$ are the corresponding representative consumers. Note that the definition of firms' individual demands with uniform price between countries corresponds to those with price discrimination, even if the final quantities will differ as a result of the different number of firms in the long run equilibria.

### 5.4.2. Firm behavior

Our assumptions on firms' symmetry across countries and cost structures characterized by scale economies remain the same, i.e., the cost function correspond to (5), with the same average and marginal costs: (6) and (7), respectively. In this case individual profits in the open economy correspond to:

$$\pi^j = q^j\left(p^j - wc\right) - wF\,,\ j=1\,,\ldots,\ M. \tag{38}$$

### 5.4.3. Short and long-run market equilibria.

As previously assumed, imperfect competition corresponds to a market structure characterized by monopolist competition. Each firm will produce the quantity that maximizes profits according to the first order conditions:

$$\frac{\delta\pi^j}{\delta q^j} = p^j + q^j\frac{\partial p^j}{\partial q^j} - wc = p^j - \frac{q^j}{S} - wc = 0\ ,\ j=1\,,\ldots,\ M. \tag{39}$$

Where, once again, marginal revenue in the second equality can be derived from eq. (35) with $\partial q^j / \partial p^j = -S = -\sum_j S_j$, whose inverse is $\partial p^j / \partial q^j = -1/S = 1/\sum_j S_j$. From (39) we obtain the following equilibrium price–a mark-up over marginal cost—once (36) is substituted:

$$p^j = \frac{q^j}{S} + wc = \frac{q_j^j + \sum_{i\neq j} q_i^j}{S} + wc\,\frac{S_j\left(\left(1-\lambda_j\right)v_{jj}^j + \sum_{i\neq j}\lambda_i v_{ij}^j\right) + \sum_{i\neq j} S_i\left(\eta_i v_{ii}^j + \eta_j v_{ji}^j\right)}{NS} + wc\,,$$

$j$=1,…,$M$, (40)

and the price maximizing profits under the uniform rule behaves as in the previous section depending on the changes in the shares of immigrants and immigrants with $\partial p^j / \partial\lambda_j < 0$, $\partial p^j / \partial\eta_j < 0$, $\partial p^j / \partial N < 0$, and $\partial p^j / \partial wc > 0$.

Again, with free mobility, there will be new entrants in the global economy if firms make extra profits, while firms will exit if there are losses. In each case, the aggregate short run number of firms, which correspond to those in the close economy will change until de zero profit condition is met:

$$\sum_j \pi^j = \sum_j\left(q_j^j\left(p^j - wc\right) + \sum_{i\neq j} q_i^j\left(p^j - wc\right) - wF\right) = 0\,. \tag{41}$$

Substituting the short run quantities and prices in this expression it is possible to recover the number of active firms in the long run:

$$\breve{N} = \sqrt{\frac{\sum_j \left( S_j v_j^j + \sum_{i \neq j} S_i v_i^j \right)^2}{MwFS}}, \tag{42}$$

where "$\breve{\cdot}$" denotes equilibrium values in the open economy under uniform pricing. Therefore, the equilibrium quantities corresponding to domestic and foreign demands are obtained by substituting the number of firms into (36):

$$\breve{q}^j = \breve{q}_j^j + \sum_{i \neq j} \breve{q}_i^j = \frac{S_j v_j^j \sqrt{MwFS}}{\sqrt{\sum_j \left( S_j v_j^j + \sum_{i \neq j} S_i v_i^j \right)^2}} + \sum_{i \neq j} \frac{S_i v_i^j \sqrt{MwFS}}{\sqrt{\sum_j \left( S_j v_j^j + \sum_{i \neq j} S_i v_i^j \right)^2}}, j=1,\ldots, M. \tag{43}$$

As in the case of price discrimination, domestic demand reduces (increases) as the share of immigrants increases (decreases), while foreign demands—exports—increase (decrease) with the share of emigrants.

Finally, the equilibrium prices can be also obtained substituting the number of firms in (40):

$$\breve{p}^j = \frac{\left( S_j v_j^j + \sum_{i \neq j} S_i v_i^j \right) \sqrt{MwFS}}{S \sqrt{\left( \sum_j \left( S_j v_j^j + \sum_{i \neq j} S_i v_i^j \right)^2 \right)}} + wc, j=1,\ldots, M. \tag{44}$$

Again, as the optimal quantities, the equilibrium price under the uniform rule is decreasing in the share of immigrants and increasing in the share of emigrants.

Regarding the geographical distribution of firms by countries in the open economy under uniform price $\breve{N}$, we note that since all firms are symmetric we must turn to the distribution of firms existing in the close economy, we resort to the allocation rule previously adopted that uses the relative proportion of firms in each closed economy in the overall number of firms: $\tilde{\omega}^j = \tilde{N}^j / \sum_j \tilde{N}^j$. Under the uniform pricing rule the long run number of firms $\breve{N}$ is distributed according to these proportions: $\breve{N}^j = \breve{N}\tilde{\omega}^j$. That way we establish a criterion to determine the quantity produced in each country, which in turn allow us to define the welfare effects of opening economies to trade under uniform pricing.

The social welfare associated to the equilibrium quantities supplied by firms in *j* defines once again as the sum of the aggregate amounts demanded by each type of consumers: i)

natives (in countries *j* and *i*, $i \neq j$, ii) immigrants from *i*, $i \neq 1,\ldots,M-1$, into *j*, and iii) emigrants from *j* into *i*, $i \neq 1,\ldots,M-1$, multiplied by the difference between their respective willingness to pay and the single uniform price:

$$\breve{CS}_j = \left( \breve{Q}^j_{jj}(v^j_{jj} - \breve{p}^j) + \sum_{i \neq j} \breve{Q}^j_{ij}(v^j_{ij} - \breve{p}^j) + \sum_{i \neq j} \breve{Q}^j_{ii}(v^j_{ii} - \breve{p}^j) + \breve{Q}^j_{ji}(v^j_{ji} - \breve{p}^j) \right) / 2 =$$

$$= \frac{\breve{N}}{2} \left( \left(1 - \lambda_j\right) \breve{q}^j_{jj}(v^j_{jj} - \breve{p}^j) + \sum_{i \neq j} \lambda_i \breve{q}^j_{ij}(v^j_{ij} - \breve{p}^j) \right) + \left( \sum_{i \neq j} \eta_i \breve{q}^j_{ii}(v^j_{ii} - \breve{p}^j) + \eta_j \breve{q}^j_{ji}(v^j_{ji} - \breve{p}^j) \right), j = 1,\ldots,M. \tag{45}$$

And the worlds' aggregate consumer surplus is $\breve{CS} = \sum_j \breve{CS}_j$ .

### 5.4.4. Comparing the open economies under price discrimination and uniform price.

Comparing these results corresponding to the long run equilibrium of the open economies with uniform pricing to those of the closed economies in section 5.3, we obtain a set of relationships equivalent to those previously obtained for the open economies with price discrimination. These relationships can be summarized in new propositions equivalent to 1 and 2, whose proofs would mirror those already presented. As a result, assuming symmetric countries in the size of the economies and demographic structures, opening countries to trade increases the amount of firms (varieties) in the global economy, while reducing that in each country; increases aggregate production—but with both domestic production and exports being smaller than the aggregate production in the closed economy; results in lower domestic and export prices; and social welfare may be smaller, equal, or larger than that of the closed economy depending on the demographic structure of the economies.

Also, with regards to the demographic structure of the countries, departing from an open economy where crossed migration does not exist: $\lambda_j = \eta_i = 0 \ \forall i,j$, increasing the number of immigrant/emigrants between countries in the same proportion increases the global number of firms (varieties) accessible to consumers in each country; does not change aggregate production—but reduces the quantity produced by the individual firm for the domestic market while increasing the quantity produced for the foreign market

(exports/imports)[34]—i.e., the pro-trade effects of migration; reduces uniform equilibrium price to a constant value consistent with the unchanging aggregate amount; and, finally, increases social welfare both at the country level and globally.

However, what is relevant is to compare the long run equilibrium values of open economies under a uniform price rule, with those corresponding to the previous situation where price discrimination is allowed. Again we assume symmetric countries both in the size of their economies and equal demographic structures. The results of the comparison are summarized in the following proposition:

**Proposition 3 (with respect to price discrimination, uniform prices reduce the global number of firms (varieties), increases the amount produced by the individual firm both for the domestic and foreign market—higher pro-trade effect of migration, leaves overall production unchanged, the single price value situates between the domestic and foreign prices, and the aggregate social welfare increases).** *Given the assumptions on equal sizes of the economies, market demands (willingness to pay parameters and demographic structure) resulting in the same representative consumers, production costs (economies of scale) and market structure (monopolistic competition with uniform prices within countries and price discrimination between countries), shifting from a situation where firms can discriminate in prices across countries, to one where a uniform price is charged: (i) reduces the global number of firms (varieties) accessible to consumers in each country* $\breve{N} < \hat{N}$*, (iia) increases the aggregate amount produced by the individual firm in each country* $\breve{q}^j > \hat{q}^j$*, as well as (iib) the amount produced for the domestic market* $\breve{q}_j^j > \hat{q}_j^j$*, and (iic) the foreign market,* $\breve{q}_i^j > \hat{q}_i^j$*, but (iid) leaves overall production unchanged* $\breve{Q}^j = \breve{N}\breve{q}^j = \hat{Q}^j = \hat{N}\hat{q}^j$ *—and therefore the reduction in the number of firms exactly outweighs the increase in the aggregate quantity; (iii) yields an uniform price comprised between domestic and foreign prices:* $\breve{p}^j \in \left[\hat{p}_j^j, \hat{p}_i^j\right]$*, and (iv) increases social welfare:* $\breve{CS}_j > \widehat{CS}_j$*.*

**Proof of part (*ia*)**: To prove that $\breve{N} < \hat{N}$ we only need to compare the number of firms in the long run equilibria with price discrimination and uniform price, showing that

[34] With both effects offsetting each other in this case, so the aggregate amount produced by the individual firms remains with symmetric immigration/emigration flows.

$\hat{N}-\breve{N}>0$. After some algebra we obtain that the following inequality must be positive: $S\sqrt{\sum_j\left(S_j v_j^{j2}+\sum_{i\neq j}S_i v_i^{j2}\right)}-\sqrt{\sum_j\left(S_j v_j^{j}+\sum_{i\neq j}S_i v_i^{j}\right)^2}>0$, which is verified.

**Proof of parts (*iia*), (*iib*), (*iic*) and (*iid)***: The proofs for (*iia*), (*iib*), (*iic*) follow from the previous proposition on the number of firms. Since eqs. (28) and (36) are equal, the only difference corresponds to the long run number of firms: $\breve{N}<\hat{N}$, and being in the denominator $\breve{q}_j^j>\hat{q}_j^j$ and $\breve{q}_i^j>\hat{q}_i^j$ hold.; for *(iiid)* we need to show that $\breve{N}\breve{q}^j=\hat{N}\hat{q}^j$ or alternatively, that $\breve{N}/\hat{N}=\hat{q}^j/\breve{q}^j$ is verified. This can be straightforwardly shown by substituting the definitions of firms' overall productions in eqs. (24) and (36).

**Proof of part (*iii*):** The proof involves showing that if $\breve{p}^j>\hat{p}_j^j$, then $\breve{p}^j<\hat{p}_i^j$ and vice versa, i.e., $\breve{p}^j\in\left[\hat{p}_j^j,\hat{p}_i^j\right]$. Given the definition of both sets of prices in eqs. (33) and (44), the differences $\breve{p}^j-\hat{p}_j^j$ and $\breve{p}^j-\hat{p}_i^j$ are null for demographic structures with the same share of natives and immigrants across countries: $\lambda_j=1/M, j=1,...M$— and therefore $\breve{p}^j=\hat{p}_j^j=\hat{p}_i^j$. Departing from this reference value, we have shown in proposition 2 (*iiia*) that the domestic price reduces as the share of immigrants increases, so for $\lambda_j>1/M$, $\breve{p}^j-\hat{p}_j^j>0$, but, conversely, foreign (export) prices increase as the share of immigrants increases (proposition 2 (*iiib*)), so for $\lambda_j>1/M$, $\breve{p}^j-\hat{p}_i^j<0$. Consequently, for $\lambda_j>1/M$, $\breve{p}^j>\hat{p}_j^j$ and $\breve{p}^j<\hat{p}_j^j$, as it was initially set out, and $\breve{p}^j<\hat{p}_j^j$ with $\breve{p}^j>\hat{p}_j^j$, for $\lambda_j<1/M$.

**Proof of part (*iv*):** The proof relies on the one above. On the one hand, given the definition of both consumers' surpluses in eqs. (34) and (44) and from proposition 3 (*iiid*), aggregate quantities under price discrimination and uniform prices are the same: i.e., $\breve{Q}_{jj}^j=\hat{Q}_{jj}^j$, $\breve{Q}_{ij}^j=\hat{Q}_{ij}^j$, $\breve{Q}_{ii}^j=\hat{Q}_{ii}^j$ and $\breve{Q}_{ji}^j=\hat{Q}_{ji}^j$. One the other, the difference $\breve{CS}_j-\widehat{CS}_j$ is null for demographic structures with the same share of natives and immigrants across countries: $\lambda_j=1/M, j=1,...M$—, i.e., $\breve{CS}_j=\widehat{CS}_j$. Therefore, we only need to show that for any value of the share of immigrants the net difference between the willingness pay and equilibrium prices for both the domestic and foreign (exports) is positive. From the previous

proposition above, for $\lambda_j > 1/M$, $\breve{p}^j - \hat{p}_j^j > 0$ and $\breve{p}^j - \hat{p}_i^j < 0$, and consequently $(v_{jj}^j - \hat{p}_j^j) > (v_{jj}^j - \breve{p}^j)$ and $(v_{ij}^j - \hat{p}_j^j) > (v_{ij}^j - \breve{p}^j)$, but $(v_{ii}^j - \hat{p}_i^j) < (v_{ii}^j - \breve{p}^j)$ and $(v_{ji}^j - \hat{p}_i^j) < (v_{ji}^j - \breve{p}^j)$. The net effect on social welfare will depend on the difference $[(v_{jj}^j - \hat{p}_j^j) - (v_{jj}^j - \breve{p}^j) + (v_{ij}^j - \hat{p}_j^j) - (v_{ij}^j - \breve{p}^j)] - [(v_{ii}^j - \hat{p}_i^j) - (v_{ii}^j - \breve{p}^j) + (v_{ji}^j - \hat{p}_i^j) - (v_{ji}^j - \breve{p}^j)] = (2(\breve{p}^j - \hat{p}_j^j) - (2(\breve{p}^j - \hat{p}_i^j))$ which is positive since $(\breve{p}^j - \hat{p}_j^j) > (\breve{p}^j - \hat{p}_i^j)$. Conversely, for $\lambda_j < 1/M$, $\breve{p}^j - \hat{p}_j^j < 0$ and $\breve{p}^j - \hat{p}_i^j > 0$, but the relative differences also reverse and the net result is also positive, i.e. foreign (exports) prices are more concave on the share of immigrants that domestic prices. Consequently, for any value of the share of immigrants value $\breve{CS}_j > \widehat{CS}_j$.

### 5.4.5. An illustration example with two countries (continued).

We continue illustrating the results summarized in proposition 3 model relying on our previous example initiated in section 5.3.6. **Figure 5.5** depicts the total number of varieties accessible to consumers in each country when firms can set different prices and when they should charge a uniform price across countries. If migration is symmetric, thereby keeping the size of the economy equal, then, the number of firms and varieties accessible to consumers are larger (both in aggregate terms and also in each country) when price discrimination is allowed, as stated in Proposition 3 (*i*)**.** The difference between the number of firms under price discrimination and the uniform price rule is lower when the demographic structure is such that close to 50% of the population is from one country and 50% from the other country. This situation produces the same results with discriminating and uniform prices. It is important to remark that this is a consequence of the structure of the willingness to pay and the symmetry that we are assuming. In a situation with different parameters, this does not need to hold. **Figure 5.5** also shows that as the share of immigrants increases, the number of varieties increases in both cases, Proposition 3 (*i*).

**Figure 5.5. Number of firms in open economies under price discrimination and uniform price.**

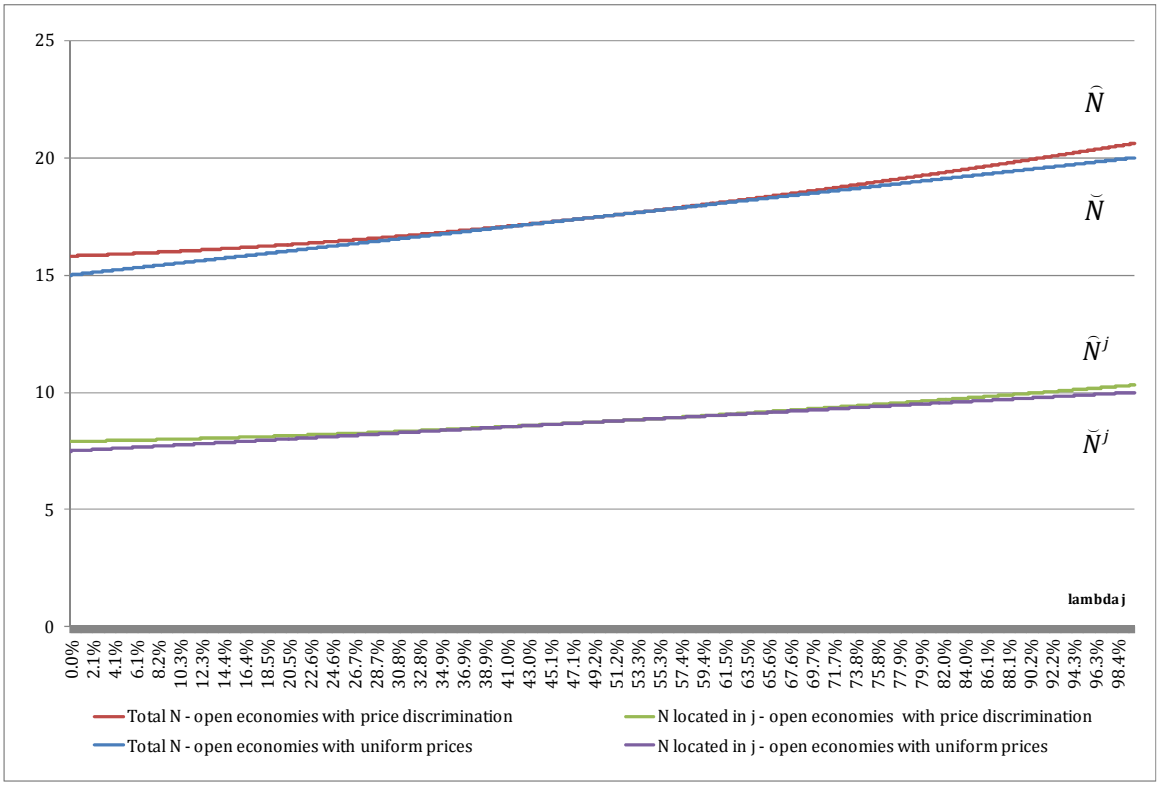
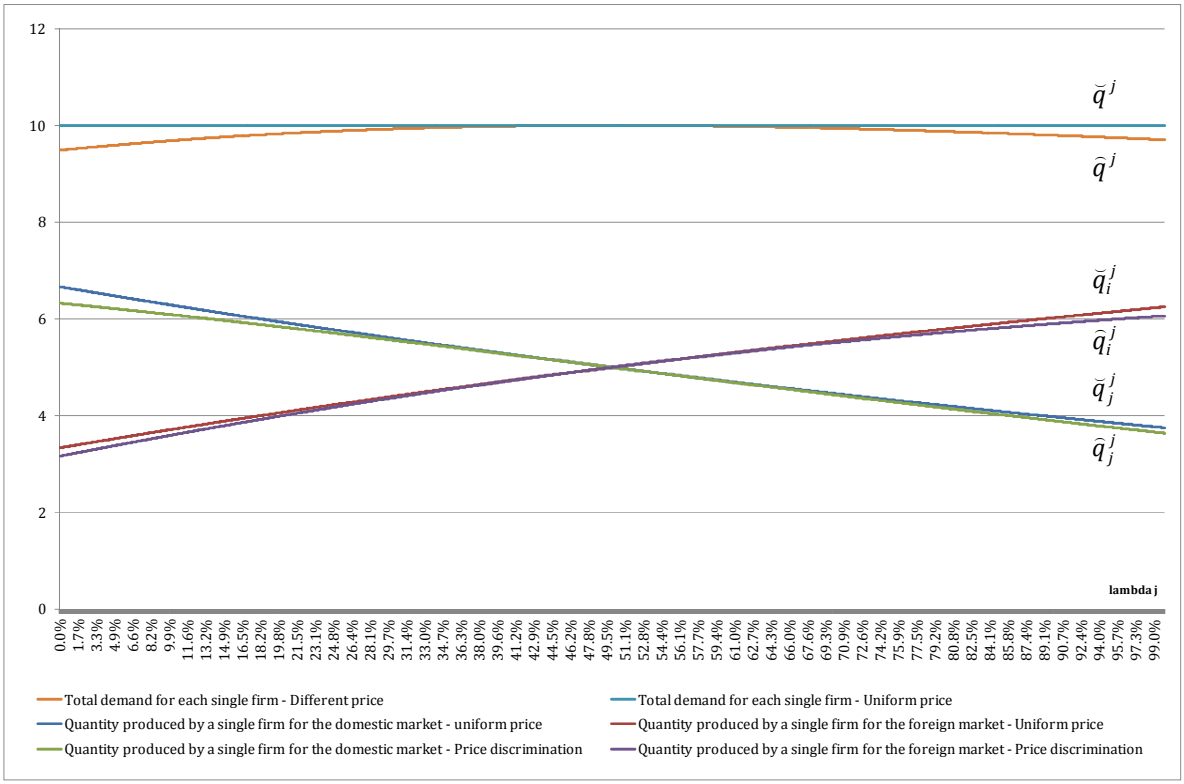



**Figure 5.6** shows that if migration flows are symmetric, once the economies open to trade, although the total number of varieties that individuals may consume is larger with price discrimination, the total quantity produced by the single firm is larger with uniform prices than with price discrimination—Proposition 3 (*iia*)—in aggregate terms and in domestic and foreign markets separately.

In addition, if migration between *i* and *j* are symmetric, keeping the size of the countries constant, as the immigrants' share over the total population in each country increases, it reduces the quantity sold in the domestic market while increasing the exports to the foreign market. This is related with the fact that when one person migrates from *i* to *j*, her willingness to pay for the products from *j* changes *(blending effect)*, but still with a lower willingness to pay than natives in *j. S*imilarly, when a person from *j* emigrates to *i*, her willingness to pay for the products from her homeland increases (*homesickness effect*). Then, as migration in both directions increases, the willingness to pay for products from *j* increases in the foreign market, while it reduces in the domestic market—Proposition 3 (*iib, iic*), increasing the share of the production that the representative firm sells in the domestic market and increasing the exports to the foreign market, respectively.

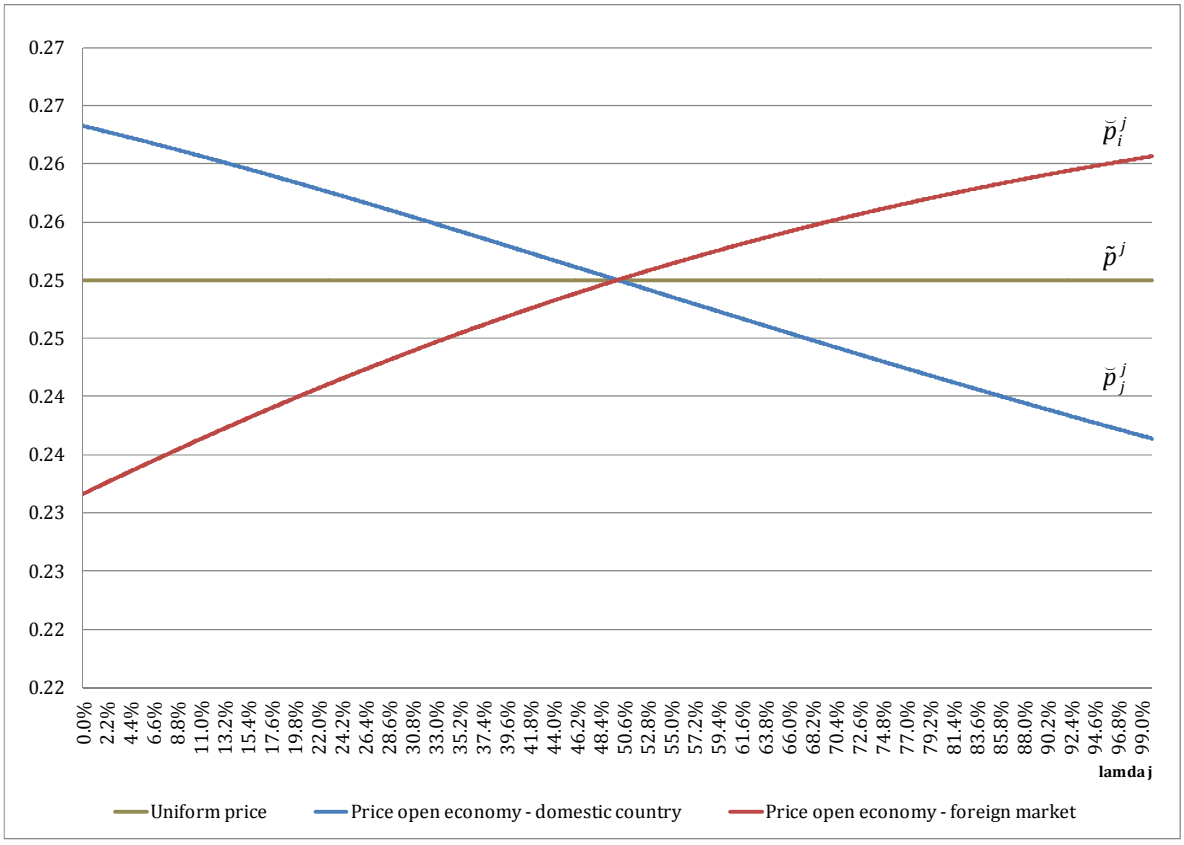
**Figure 5.6. Quantities in the open economies under price discrimination and uniform price.**




If firms can set a different price in each market according to the demographic structure in each market and if we assume that consumers have preferences as those that have been described in section 5.3.6, **Figure 5.7** shows that the price that a firm will set in the domestic country will be higher, since the representative consumer in the foreign country has a lower willingness to pay for its products. If price discrimination is not allowed, and the firm must charge a uniform price across countries, this price will be a linear combination of the willingness to pay of the representative consumers in both countries and the sizes of both countries, resulting in a price in between the domestic price and the export price when price discrimination is allowed, Proposition 3 (*iii*).

In a situation when the migrations between countries *i* and *j* are symmetric, as when the share of immigrants from *i* in *j* (and immigrants from *j* in *i*) increases, the optimum price that the firm will set in each market gets closer, reducing the price in the domestic market and increasing in the foreign market, Proposition 3 (*iii*).

**Figure 5.7. Prices in the open economy. Uniform price, domestic and export prices.**




Finally, **Figure 5.8** illustrates the total consumer surplus for the open economy with price discrimination and uniform prices. In aggregate terms, the consumer surplus is always higher with uniform prices than when firms set different prices in each market, Proposition 3 (*iv*). It is remarkable the substantial increase in the consumer surpluses as long as the migration shares symmetrically raises in both countries. **Figure 5.9** shows the difference between the consumer surpluses when firms must charge a uniform price across countries and when they can price discriminate in each market. In this example where individuals and economies are symmetric, this difference reduces when the share of immigrants from each country is close to 50% (same demographic structures). This is in line with the fact that at that equilibrium values are equal with price discrimination and uniform prices.

**Figure 5.8. Consumer surplus in the open economy under price discrimination and uniform price.**

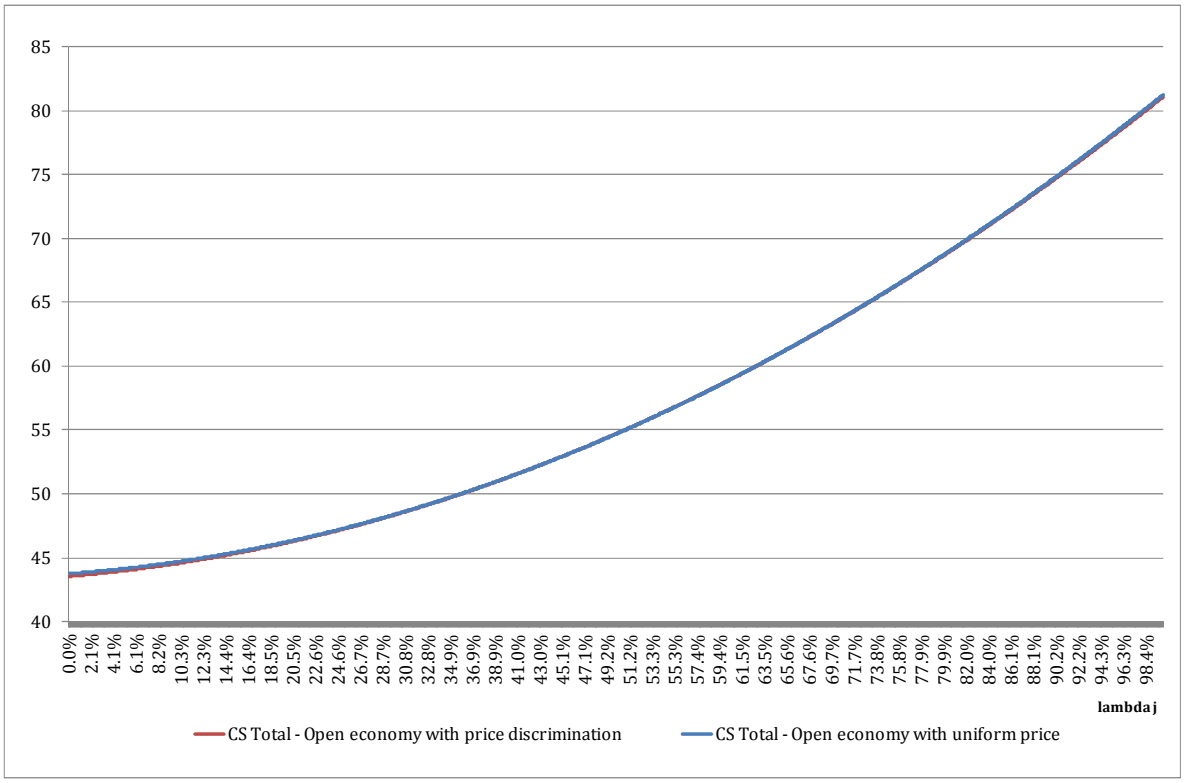
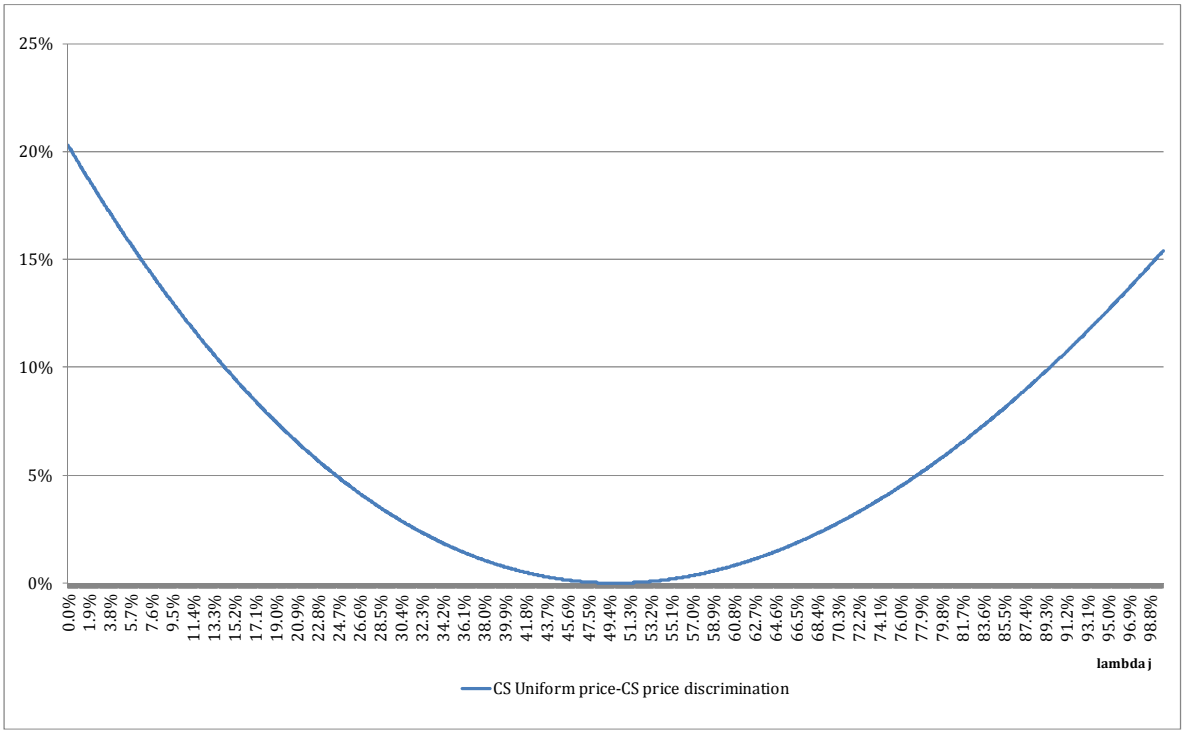



**Figure 5.9. Difference between the consumer surpluses under price discrimination and uniform price.**



## 5.5. Conclusions

In this chapter we have set out a simple framework to shed some light into the mechanisms behind the 'taste channel' that has been described in the empirical literature analyzing the trade creation effect of social networks. To this regard, the analytical model has been developed for three different situations: first, the extreme case of autarchy, in which countries are closed to trade; second, the more realistic case in which countries are open to trade and although they are not able to discriminate prices within each country, they can set different prices in each country depending on the characteristics of their demands; and third, when countries are open to trade, but price discrimination is banned. The analytical model developed considers the relationships between immigration stocks, differences in willingness to pay, and the possibility of price differentiation by firms across countries according to the demographic structure of the populations. Although several applications could be drawn for services, this article follows a more general approach that makes it also suitable for goods.

One of the issues that have been avoided in the literature is the fact that if a different willingness to pay for a good is detected by a firm, it will adopt an optimal behavior resulting in price discrimination and the reallocation of production in one country or another, so as to maximize profits. In our approach, the willingness to pay of the representative consumer in each country depends on the origin of the product and the home land of the individual.

The analytical model developed in this chapter takes into consideration the effect of consumers' heterogeneity in a monopolistic competition market struture. In each market we describe at least two types of consumers (natives and immigrants). Then, consumers will show a higher willingness to pay for the products from their homeland and this willingness to pay also changes when they migrate. When one person migrates, her willingness to pay increases both for the varieties from her homeland (*homesickness effect*), but also for the varieties from the host country (*blending effect*), since she started to acquired the habits of the host country.

The results from the model establish that if a 'taste effect' for the products from the homeland exists, the existence of crossed migration flows increases the bilateral trade flows (quantities produced for the foreign markets: exports/imports, i.e., the pro-trade

effect of migration is confirmed) at the expense of domestic production. Correspondingly, the price is lower the larger the share of immigrants in the territory where the firm operates, but higher in foreign markets if the stock of immigrants from the country where the good is produced increases. This result holds regardless of whether firms price discriminate or not.

In terms of social welfare analysis based on the consumer surplus a relevant result is found. In contrast to the standard intra-industry model of homogenous consumers where migration flows are irrelevant as representative consumers are always the same, and where opening countries to trade increases social welfare, in the case of this model where individuals present different willingness to pay for products depending on the country of origin and residence, opening countries to trade is welfare detrimental if the stocks of immigrants and emigrants are small. This result is due to the fact that since there is a taste-effect that favors homeland products against imported ones, opening countries to trade increases the competition between firms to a larger extent than the effect of the increment in demand brought about by the addition of foreign demand to domestic demand. On the contrary, as migration flows increase, social welfare in the global open economy increases while that of the closed economies—considered also in the aggregate—reduces. Eventually, the former is larger than the latter, and opening countries to trade is welfare enhancing.

These results are promising but the connection with more sophisticated models could be done, such as it the introduction of Dixit-Stiglitz preferences and iceberg the transport cost. When introducing transport costs, the taste and the information effect can be introduced at the same time in the model. In a further step, the trade model described here may endogenize factor mobility so as to connect with the New Economic Geography framework, which in turn could be used to explain to what extent the existence of heterogeneity in consumer preferences introduce an additional factor explaining the agglomeration and dispersion patterns of economic activity.

## 5.6. References

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# 6. Conclusions: Summary, final remarks, policy implications and future research agenda.

## 6.1. Introduction

In this chapter a summary of the work and main findings are described, together with some policy implications and the future research agenda.

## 6.2. General summary

**Chapter 1**

The first chapter of this Doctoral Thesis sets the framework in which the rest of the chapters are developed. It reinforces the idea of tradability of services according to the new approaches of the main international statistical offices (i.e., GATS).

**Chapter 2**

This chapter describes the methodology proposed to obtain a database of interregional flows of services in Spain for the period 2000-2009. A similar approach may be used to compile additional data for other services, although one should keep in mind the special characteristics of each sector, and the ways (modes) in which the provision of the service takes place when suggesting a specific methodology. The sectors analyzed in this Doctoral Thesis are associated with cross-border movements of people and linked with the tourism activity: Accommodation, Restaurants and Travel Agencies.

The heterogeneity in the way in which the provision of these services takes place stands out even if a this group of related activities. For example, if one endorses the classical approach that considers as 'non-tradable' those activities that tend to be sold within a spatial unit under consideration, Travel Agencies might be considered as 'non-tradable', since the consumption is usually done in the region of residence. As we have shown in this thesis, this concept of 'tradability' is dependent on the level of the spatial units , since a sector with no international exports could produce intense interregional exports within a country, that are categorized as domestic demand by national accounting standards. Therefore, we suggest to be more cautious, and to avoid the use of categoric characterizations like 'non-tradable goods or services', and refer to them just as a pure intraregional trade flows. Moreover, the non-tradability of a specific activity such as Travel Agencies could change dramatically, just by considering the development of the new technologies of communication and internet, and the increasing tendency to buy flights and traveling packages through specialized websites, whose location could be undetermined or offered from a remote spot. However, consumption in the Hostel industry (Accommodation) usually takes place in a location different from the region of residence. Halfway is the sector of Restaurants where there are two typologies of consumption: one part takes place in a daily basis and another one is linked to trips.

Then, the gravity model is suggested as the proper framework to analyze bilateral trade flows.

**Chapter 3**

In this chapter the effect of social and business networks on bilateral trade flows of services is analyzed, with a special focus on the heterogeneous behavior for accommodation, restaurants and merchandise interregional flows.

Methodologically, the Pseudo Poisson Maximum Likelihood procedure estimation procedure has been used in order to correct the potential heteroskedasticity (Santos-Silva and Tenreyro, 2006), while the multilateral resistance terms are controlled using origin and destination specific fixed effects (Feenstra, 2004). The endogeneity problem due to reverse causality is tackled using the instrumental variables approach of the latter estimation. For the social networks variable, the lag variables are used as instrument, while for the case of the reverse causality in business networks, the analysis is restricted to the period 2007-2009, as data for this variable is only available for 2006. .

**Chapter 4**

In this chapter the intensity between interregional trade flows of services is studied using a gravity model that relies on conventional distance measures thought to inhibit flows, plus spatial econometric methods that allows introducing social network relationships between regions into the gravity model. The latter are based on use of the stock of interregional immigrants living in each region to form a spatial weight structure linking regions. This type of interregional dependence is contrasted with more conventional weight structures based on the geographical proximity of the regions. We exploit the efficient Bayesian econometric approaches based on Markov Chain Monte Carlo (MCMC) estimation methods. Behrens et al. (2012) derived a structural gravity equation system in which both the trade flows and error terms are cross-sectionally correlated and can be estimated using techniques from the spatial econometrics literature. Based on their findings, controlling directly for cross-sectional interdependence reduces the magnitude of border effects by capturing 'multilateral resistance' that is not totally controlled when using origin and destination specific fixed effects.

**Chapter 5**

Finally, an extension of the standard intra-industry model based on scale economies and monopolistic competition allowing for heterogeneous consumers is proposed. The main novelty is considering the possibility that migration flows change the willingness to pay of the representative consumers in each country. The ordering of the willingness to pay depends on where the individual resides (in her country of origin or other destination country) and the place where goods are produced .In general, the willingness to pay for products related to the country of origin of the consumer is higher than for other products (home-bias effect). As consumers are heterogeneous, this immediately leads to the

possibility of a price discrimination strategy on the parts of the firms, who will charge different prices depending on the demographic structure of each country, i.e., even if firms cannot discriminate consumer *within* countries, the may practice it *between* countries. However, the case of uniform pricing when firms are not allowed to price discriminate is also studied (as in the E.U. competition policy legislation). The effects of moving from autarky to open economies is thoughtfully analyzed (i.e., the comparative statics of both equilibria) as well as the comparison between price discrimination and uniform pricing. As a result, once the countries are opened to trade, there are two possible strategies: differentiate prices between countries (with a uniform price within countries) or set a uniform price in the whole world. Finally, the effect on the social welfare of opening economies to trade with different or uniform prices across countries considering the heterogeneity across consumers as it is suggested by the 'taste effect' channel described in the literature is studied.

## 6.3. Main findings

- Based on a first analysis of the main geographic patterns of the interregional flows, a heterogeneous behavior depending on the particular sector has been found. For some sectors, the intraregional flows as well as the flows within short distances are very important due to the consumption in the regions of residence, but also because of short trips to close regions during the weekends (sometimes excursions), usually with the aim of visiting relatives or friends in the contiguous regions. However, for accommodation a different situation arises because people look for more different places, and because of the impossibility to visit distant places without an overnight stay in some establishment. Sometimes, larger flows are found between regions that are closely linked through historical flows of people that results in a large stock of interregional migrants.
- Although the effect of networks should be more relevant for international than for interregional trade of goods, given that the differences in institutions are larger across countries than across regions, the contrary may be observed services. For some sectors, personal ties explain to a larger extent the trip to a given region, than the potential gains in the reduction in information costs.
- Chapter 4 shows a heterogeneous effect of the social and business networks depending on the sector. Then, a situation where the social network acts as a substitute for the economic activity of the firm appears, while the trade in

Restaurants is enhanced by the stock of immigrants. When results for services are compared with those obtained for goods, the different behavior of goods and services is confirmed. Then, for interregional trade flows in merchandise a stronger effect of business networks is found.

- Focusing on the average effect and with a special interest on how the flows between nearby regions behave, in Chapter 4 the autocorrelation across flows both to/from contiguous regions and to/from regions with strong demographic linkages is confirmed. These results obtained in the last empirical paper (Chapter 4) suggest the need for considering the influence of neighbors when modeling origin-destination trade flows in the modeling strategies applied in Chapters 2 and 3. Although the coefficients obtained in Chapter 4 do not change dramatically when the cross section autocorrelation is controlled for, as part of the effects of 'the alternative origins/destinations' for each particular pair *ij* is somehow captured by the origin and destination fixed effects, in line with some recent articles (Behrens et al, 2012), it seems convenient to proceed with some kind of treatment for potential cross-section autocorrelation affecting our estimates—or at least perform some test for spatial autocorrelation in the residuals.
- The final conclusions are derived from the theoretical model, which indeed considers the relations between immigration stocks, differences in willingness to pay, and the possibility of price differentiation by firms across countries according to the demographic structure of the populations. Although several applications could be drawn for services, this article follows a more general approach that makes it also suitable for goods. The results from the model establish that if a taste effect for the products from the homeland exists, the existence of crossed migration flows increases the bilateral trade flows (quantities produced for the foreign markets: exports/imports, i.e., the pro-trade effect of migration is confirmed) at the cost of domestic production. Correspondingly, the price is lower the larger the share of immigrants in the territory where the firm operates but higher in foreign markets if the stock of immigrants from the country where the good is produced increases. This result holds regardless of whether firms price discriminate or not.
- Welfare analysis based on the consumer surplus summarizes the overall effects of the number of firms, quantities and prices. A relevant result is that contrary to the standard intra-industry model of homogenous consumers where migration flows would be irrelevant as they do not change the representative consumer, and where opening countries to trade increases social welfare, in the case where individuals present different willingness to pay for products depending on the country of origin

and residence, opening countries to trade is welfare detrimental if the stocks of immigrants and emigrants are small. This result respond to the fact that since there is a taste-effect that favors homeland products against imported ones, opening countries to trade increases the competition between firms to a larger extent than the effect of the increment in demand brought about by the addition of foreign demand to domestic demand. On the contrary, as migration flows increase, social welfare in the global open economy increases while that of the closed economies—considered also in the aggregate—reduces. Eventually, the former is larger than the latter, and opening countries to trade is welfare enhancing.

## 6.4. Policy implications

Based on the results obtained in the analysis of the intraregional and interregional trade flows of these three sectors in Spain, we want to finish drawing some conclusions and potential recommendations that might be of help when designing and implementing different economic policies:

1. From a methodological point of view, it is appropriate to highlight the importance of the service sector and its growing "tradability" in modern developed economies.
   i. The importance of services output in the total output of a country is not reflected in the international trade statistics. For many years, and still nowadays, the large share of services that is domestically consumed has resulted in their consideration as “non-tradable”. However, this tendency has changed recently as a consequence of a remarkable growth of international trade of services. Moreover, when we focus on interregional flows within a country, we find that some services like the ones considered here are really tradable. In fact, for a medium-size country like Spain, with a large touristic tradition, we find that an important part of the demand of these sectors comes from other regions within the same country. Given the share of interregional trade on services output, policies to increase demand should take into consideration foreign demand from other regions.
   ii. The above discussion should also lead to a much more determined effort in the compilation of statistics on trade in services that allows to follow and to analyze the transactions both within and outside the borders, considering

different spatial units both within and outside each country. In this regard, we recommend a greater effort of clarification of the concepts (tradable vs. non-tradable; residency of consumers vs. spatial allocation of the service; firm level vs. plant level…), an integration of efforts not only between different territorial areas (international, national, regional, local) but also among statistical agencies that cover different issues related with the same multi-faceted economic reality (trade, transport, tourism, mobility, costs, prices).

2. With regards to the production of the required statistical data, and the development of methodologies related to the estimation of interregional trade flows within a country, we suggest the following recommendations:

i. In our approach, a multiregional framework is considered, which applies a homogeneous and comparable methodology for all the regions in the country. This contrasts with the approach followed by other works adopting uni-regional approaches, which are unable to obtain final estimates compatible with the main macro-magnitudes obtained for the supply and demand, both at the national and regional level.

ii. In this regard, the data obtained has been compared to the official figures: balance of payments and regional tables input-output, production and consumption statistics...

iii. From the experience gained in working with the available statistics for services, more effort seems to be needed in reaching the desirable coherence between national and regional official agencies, and also between supply and demand data.

Regarding the results obtained, first, it should be noted that, when measuring the competitiveness of a developed economy, where services accumulate a high level of activity and employment, researchers and policymakers should not just take into account international trade in goods (manufacturing), but also intraregional and interregional trade in goods and services. According to what has been observed in previous research on interregional trade of goods (Gil et al., 2005, Ghemawat et al., 2010; Llano et al., 2011), the conclusions on the integration and competitiveness of the Spanish economy, and in each of its regions, will be partial and incomplete when these spheres are omitted in the analysis.

3. As a result, it seems important to take care of all aspects of the competitiveness of products and services in Spain, reducing eventual trade barriers that may exist

(legal, fiscal,...) so as to achieve a true single market, and enhancing the development of adequate transport infrastructures to connect all regions, and in particular, those that due to their remote location or lack of accessibility, may become more disconnected from the main national and international markets. In my view, a greater coordination between different levels of governments is desirable when promoting domestic trade and transport of services. In relation to this point, for example, our analysis suggest that the design of the right transport infrastructures within a country have to take into account –simultaneously- the goal of increasing the accessibility of all regions both for the mobility of goods and people.

4. With regard to the promotion of competitiveness in each region, it seems relevant to consider the international and domestic market, trying to promote the developments of the products and services related to the tourism activity in richer regions or those with higher growth potential. Alongside policies that promote the internationalization of companies operating in new foreign markets, it is important to propose initiatives that help to strengthen the large amount of flows observed in the domestic market, trying to expand, consolidate and reinforce the existing advantages in certain regions. The identification of the main drivers of such strong relations is also important. In this thesis, and the related works of the author, several factors have been analyzed to some detail (geography, existence of a business network; existence of a sectoral clusters, etc.).

5. Although regions compete in the domestic and international market, there is also room for greater coordination in policies to promote trade. For example, our analysis on interregional trade flows of the three sectors linked to the tourism has shown how neighbors can profit from any given flows connecting two pair or regions, first by sharing common infrastructures, but also by means of spreading information and tastes, or promoting cross-border excursions or multi-destination trips. The empirical analysis and the policies to reinforce demand in a given region, cannot be isolated in considering *ij* flows, but should consider the place where the service is produced as a characteristic of the product, how consumers from different regions valued differently each product and the influence of others (interdependence) trying to promote joint policies with neighbors.

6. Although most of the empirical analysis conducted in this thesis have focused on aggregated flows, without splitting the heterogeneous behavior of agents depending on the aim of their displacements, it is clear that the exploration of this additional dimension would also bring new forms of political intervention. To this regard, it is also desirable a further coordination of sectoral policies (transport, culture, sport, health or education), that could enhance the natural features of a region to attract visitors and engage in a more intense trade of services with the richest and more populated regions. This idea is related to the suggestion —popping up in different parts of this thesis—of carrying out sector specific analysis considering the particular characteristics of each service sector. But it is also compatible with the idea of promoting inter-sectoral analysis and their related policies, with the required coordination.

7. The policies referred should take into account the results found in this and related publications in relation to the heterogeneous "tradability" of services observed, considering the important influence exerted by second homes and stays over homes of friends and family. It is important to take into account the aim of the policy and whether there could be deviations from the originally planned goal if decision makers do not consider the effect of networks in each sector. For example, social networks could enhance the number of trips to a region, because there is a reduction in the actual costs in some services, acting as a substitute of the providing firm.

i. For example, given that for most of services, consumers and producers should be in the same place at the time the exchange takes place ('proximity burden'), the efficiency of the transport sector plays an important role for trade in services. Then, sectors that want to promote the consumption from any other region, must promote and encourage the use of the transport infrastructures that are underused in order to reinforce or to create new interactions between the agents in both regions, so as to favor consumption of other services. This could be a way to reinforce the personal ties and to enhance the positive effects of the past migration stocks on the present and future trade flows—as suggested by the theoretical model with heterogeneous consumers.

ii. Thus, from a more general perspective, the results obtained here and in the revised literature suggest that policies, to succeed, have to take into account

how institutions, as well as social and business networks, impact on the demand of the firms in the sector. Then, when a policy to promote trade in a sector in a region is designed, it should be considered that the likelihood of a social network to exist, as well as how individuals interact with the rest of the agents in the rest of the regions, matters to the expected results of a policy.

8. Although it is out of the scope of this work, in line with the suggestions of the leading experts on growth and competitiveness, it is necessary to promote a model of growth driven by competitive advantages (inside and outside Spain), which will take into account both manufactures and services. This new model must consider the integrating character derived from an intense history of interregional migration within the country, which crystallizes in strong social networks and promotes a high level of intra and inter consumption related to displacement because of leisure, work, health or education. In this sense, it is also needed to emphasize the integrating character of the domestic migration flows and how the way in which the individuals and firms interact among them could be a strategic factor.

9. While many of the ideas and economic policies proposed here are based on the Spanish case, it is important to draw attention to the important integrative effect that intense internal migration flows over the years can generate within a country (or between countries) in terms of social networks, information flows, trade flows of goods and services. Note that as it has been described in Chapter 4, the largest migration movements in the world are taking place nowadays within rather than between countries (i.e. more than 150 million people moved internally in China, or more than 40 million within Brazil just between the 1960s and 1970s). Based on our findings for the Spanish case, and taking into account the enormous migration flows observed in these countries, one should expect strong consequences on the future evolution of the interregional trade flows of goods and service within such countries, enhanced by the social and business networks existing between the regions within these countries. For example, in line with some of the results found here for the Spanish case, if one considers that the trade creation effects generated by the social networks was statistically significant in both directions (emigrant and immigrant effect), one may argue in favor of a pro-development effect of the current interregional migration flows (from poor to rich regions) in the future

performance of the lagging regions (i.e. positive spillovers), maybe trough the development of interregional trade flows in a future stage of development.

## 6.5. Policy implications

The work done in this Doctoral Thesis opens a large possibility of future extensions in the field of trade of services and interaction models in the framework of New Trade Theory (NTT) and the New Economic Geography (NEG).

First, concerning the methodology developed to obtained the dataset used along this thesis, although the sectors analyzed represents an important share of the total services sectors in Spain, there are some other services whose activity is even more important, both in terms of absolute levels (retail) but also with regards to their strong backward and forward effects over the whole economy (transportation). To this regard, one of the most direct extensions of this current work is the expansion of the current dataset with the aim of including at least these two additional service sectors, and with the aim of analyzing all the potential interactions between them. I want to remark at this point that, in parallel to the present thesis, I have already produced within the C-intereg Project the corresponding figures for the interregional trade of services produced by 9 Transport sectors. For strict space and time constrains, the analysis of such rich dataset has been postponed. In addition, although the importance of the domestic trade for the case of services has been highlighted, the analysis will be enriched if the datasets would also include the international sphere.

Regarding the chapters analyzing the trade creation effect of social and business networks the main extensions will be mainly methodological, for example with a deeper analysis on the treatment of endogeneity using novel instruments or procedures to avoid biases caused by reverse causality and omitted variables. As it has been pointed out in Chapter 3, the number of branches of savings banks versus the homeland of the headquarter might work as an instrument (also for the migration variables), and the propensity score matching approach may be used as a robustness check. A more rigorous treatment on endogeneity should be carried out in order to confirm the complementarily or substitutability of the social network with the activity of firms in the provision of services, which is one of points of interest that have arise in this thesis. This point also needs to be confirmed with the use of different 'social network' measures.

In the chapter exploring the cross section autocorrelation of the flows, alternative spatial models as the SEM or SLX models should be also tested. In addition, the spatial filtering procedure will be useful in order to drop the spatial autocorrelation of the flows and then, use the proper methodological estimation technique for this kind of flows that suffers from heteroskedasticity as it is PPML. Finally, the dynamic perspective of the data will be exploited in a future work.

Finally, regarding the theoretical paper, in line with the new trade theory, the main analytical relations should be obtained based on the Dixit and Stiglitz (1977) demand framework, using an homothetic CES utility function specification, but extending it so as to incorporate alternative willingness to pay. After that, a general equilibrium model should be developed in order to obtain simulations on the effect of the agglomeration of the economic activity depending on the values of different parameters or the structure of the transportation network. To this regard, we believe that the standard core-periphery model that considers services as non-tradable, a 2 regions world and a single unit transport mode, could be rendered more flexible by embedding the heterogeneity in consumer preferences. Finally, it should be checked whether or not the results analytically obtained concurs with the real data.

## 6.6. References

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